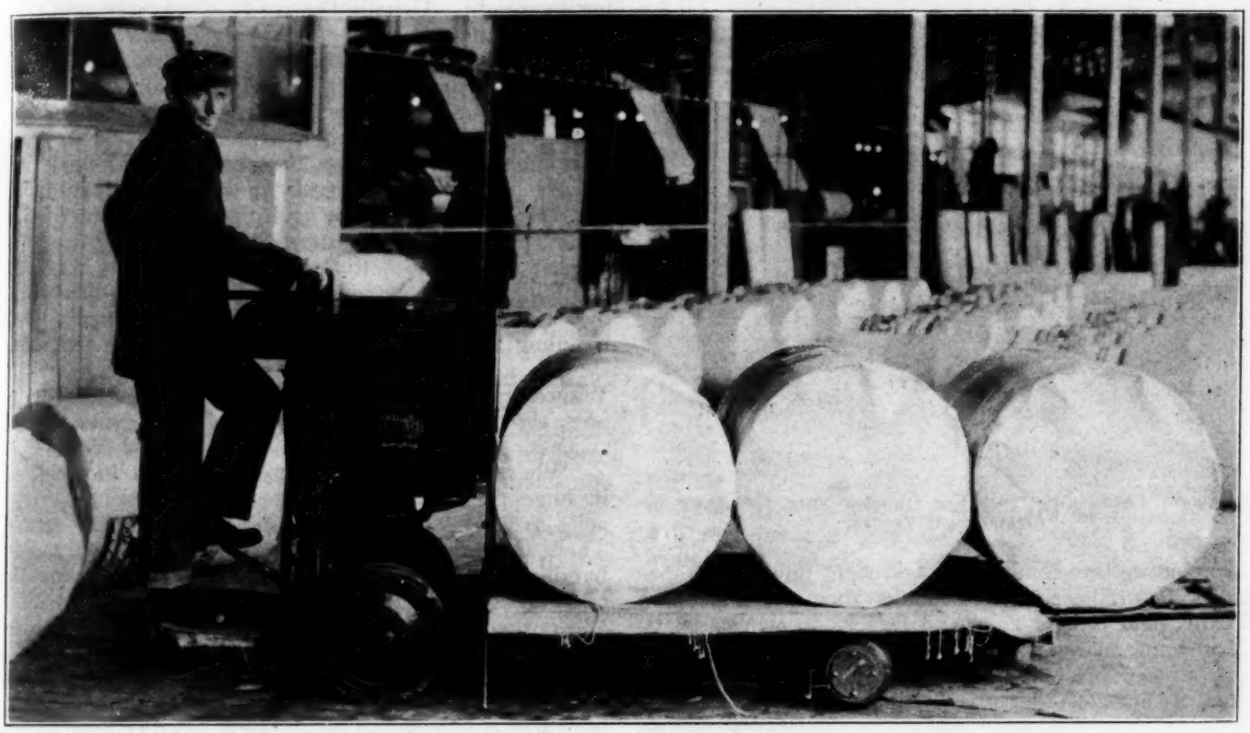
Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT

VOL. 75—No. 22. CHICAGO, SATURDAY, NOVEMBER 29, 1919. PAGE 895.



Paper Rolls Are Difficult and Dangerous to Handle by Hand—The Electric Truck Handles Them Easily, Quickly and Safely.

Electric Trucks and Tractors in Printing Plants

Advantages of This Class of Apparatus in Printing Plants—Reasons for Its Special Consideration at This Time — Methods of Applying Electric Apparatus to the Handling Problems of Such Plants

By BERNARD J. DILLON

IN SOME respects the printing industry is among the most advanced along the lines of modern efficiency and in its adoption of mechanical methods as a substitute for hand labor. This is shown by the widespread adoption of modern typesetting and printing machinery of all kinds which is now in general use in the majority of plants and which represents a tremendous advance over the old-time manual methods and early crude machinery. It is also true that modern printing processes are a great improvement over the older processes not only with regard to efficiency of production but also in the quality of the results obtained.

Most of this advancement, except in a few of the later plants, however, can be partly attributed to outside influence. The adoption of modern printing machinery, for example, is as much, if not more, the result of the efforts of the manufacturers of such apparatus as it is of the printers.

From within the industry itself the advance in modern efficiency has been comparatively slow. This is shown by the poor lighting facilities usually found in print shops, despite the large amount of night work done, and by the layout of the machinery which is seldom arranged with a view toward securing the maximum of efficiency or production. In many other ways also the older practices still exist. When associated with modern machinery the inefficiency of such methods is even more apparent and complicated and, in addition, prevents realizing the advantages of the machinery to the fullest possible extent.

This latter condition applies particularly to the

methods of handling employed in the great majority of printing plants at the present time. In all except a very few such plants the necessary handling of stock, type, forms and other materials is still accomplished by brute force and perseverance with manual labor that somehow is maintained in spite of its exorbitant cost and the difficulty of securing it.

In the majority of printing plants of any size it is safe to assume that the introduction of electric industrial trucks or tractors offers a valuable means of

Awkward Loads Like This Are Handled Very Efficiently by Electric Lift-Trucks.

overcoming this condition. And right now is an especially favorable time to consider them. Competition in this field is very keen and largely on a price basis. Many new plants are being established wherein modern efficiency methods will prevail, and to meet this competition the older plants are being remodelled and enlarged and are adopting every possible means to improve their efficiency.

On account of the various types of printing establishments the real advantages of electric industrial handling apparatus can only be realized by a thorough investigation of the local conditions in each plant. However, it is worthy of careful consideration in every case for such apparatus offers one of the best means of reducing costs without making any expensive plant changes. Central-station men, contractors and others of the electrical field should also accept this opportunity of promoting the use of electric handling apparatus, for not only will it result profitably for them but in the majority of cases they will render a valuable service to the printers as well.

The principal advantages to be derived by the application of electric industrial trucks or tractors to the handling problems in the printing industry are: An actual dollars and cents saving in handling costs which can be easily determined; an opportunity for increased production and efficiency which is also especially desirable and which in many cases is even greater than the first; fewer and better workmen will suffice. These are more contented and satisfied with the result that the losses due to labor turnover are reduced.

The extent of the actual savings in labor will, of course, depend upon the amount of handling done and the conditions under which it is done. Modern printing machinery has eliminated handling to a great extent by multiplying the operations performed on one machine. In every establishment, however, there are usually performed several distinct operations frequently in different rooms or on different floors. Transferring materials for these various operations involves a considerable amount of hand labor that can be avoided by the use of an electric industrial truck or tractor.

The first handling operation in a printing establishment is the carrying of paper stock from the receiving platform to the storage space. Where flat-bed presses are used the paper stock is received in sheets of various sizes either in ream lots or in cases, according to weight. Usually the stock is uncrated and left to season and dry out before being used. The paper is then placed on skids or four-wheel trucks. Two-wheel hand trucks cannot be used generally due to the size of the sheets and because the possibilities of damaging the stock by such handling are very great. This operation, therefore, presents an ideal field for the elevating-platform truck or tractor. When used for such work either type will replace the labor of six or more hand-truck operators and perform the work quicker and without the confusion, crowding and re-handling that accompanies such operations when done by hand. In addition, it will often save further re-handling for enough stock can be piled on a truck or skid to make it unnecessary to unload and repile it. Where the stock must be piled very high, however, portable piling machines can be used with great success.

Where web presses are used the stock is received in huge rolls weighing up to 1800 lbs. each. These rolls are very difficult to handle or place in stock. There is also an element of serious danger involved in handling them by hand due to their tendency to slip and roll. As a rule, the rolls are placed on low dollies and pushed from place to place or rolled one at a time. In either case their transfer is a slow, tiresome process usually requiring two men to a roll. In an accompanying illustration an electric truck is shown carrying three such rolls. This does not overtax the truck's capacity and the rolls can be carried at a rate of about six miles per hour with ease and safety. It can also carry them up grades as high as 30% which will permit piling the rolls if a runway is available.

Only a very few printing houses, however, are in a position to use an electric truck profitably for this receiving operation alone. They must also be used to transfer the paper from the stockroom to the presses and usually for further operations as well. The first of these operations—that of carrying stock from the stockroom to the presses—involves practically the same conditions as those of receiving except that the length of haul is usually greater and elevators must be used more often. In many cases it will be found that the elevator capacity is not sufficient to accommodate the electric and its load at the same time. This condition can usually be met by carrying the electric and the stock separately or by using separate electrics on the various floors. For carrying directly to the press the electric offers the advantage that the stock can be placed in the most convenient position for the operator and the aisles and floor spaces in the vicinity of the machines can be kept clear.

After leaving the presses the number of operations through which the stock must be taken depends entirely upon the nature of the work. Usually there are several which include stuffing or gathering, binding, etc. Careful handling is essential in all these operations and the stock is usually very awkward to handle in this semi-finished condition. The greater power of the electric is, of course, a very desirable feature

for such handling. Huge loads of stock can be carried quickly and smoothly without any jerking or jarring and the operator can easily avoid any obstacles or rough places without exerting himself in the least. He will, therefore, take greater pains to transfer the load without danger.

In transferring the finished product to the mailing and shipping rooms the electric is also very useful and efficient. Its advantages are especially desirable when facilities for such operations are limited, for the product can be kept in motion continually and overcrowding avoided.

The principal objection to the use of electric industrial trucks or tractors offered by printers is that common to all industries but is especially apparent in this —that is, that the aisles and passageways are too narrow and crowded to permit the use of the electric. This condition is usually exaggerated. The modern electric industrial handling equipment is so flexible in respect to steering and control that there are very few places where a hand truck is used that an electric cannot be used also. The majority of electrics can be turned around in a very short radius and their ability to go in either direction enables them to get into and out of very cramped quarters quickly and without endangering the adjacent walls or materials. Moreover, with electrics the materials can be handled more efficiently with fewer trucks which, in a large measure, will relieve crowding and congestion in the aisles and passageways.

In addition to the handling of paper stock there are many other materials to be handled in printing plants for which an electric is desirable, principally the handling of type and forms. These are composed chiefly of lead and are very heavy, an average 16-page trade magazine form weighing about 400 lbs. They are also bulky and difficult to handle by hand. Furthermore, they must be handled carefully for the type metal is soft and any marring or scratching will ruin it. For this, as well as for the other handling problems, the electric not only offers a more efficient and practical method of handling but reduces the possibilities of personal injury to the employes to a considerable extent.

There are also many other advantages to be obtained by the use of an electric industrial truck or tractor in printing houses, chiefly of a general utility nature, such as the moving of exceptionally heavy machinery or large parts. Very few such plants are equipped with cranes or other means of power handling and this work is usually accomplished by utilizing all the man power available. When an electric is used a little ingenuity on the part of the operator will often permit of such unusual operations being conducted quickly and without drawing on the strength of workmen who should be employed in other and more essential duties.

It is not to be expected that many printing plants can use a separate truck or tractor for each of these operations or for any one of them alone. When the amount of handling operations is considered, however, and the advantages of the electric applied to all or part of them, the possibilities of this apparatus in this field can readily be seen. The majority of electric industrial trucks or tractors on the market now are very sturdy, reliable, durable and efficient. Under ordinary conditions they will save the labor of six or eight men for a small portion of the present cost of hand labor. The operators, however, should be carefully chosen; they should be competent and careful and should be given complete charge of the equipment.

Nor is it to be expected that in every case the saving in labor alone will suffice to provide for an electric. In many cases the increase in efficiency or production or the maintenance of labor is the deciding factor.

One of the greatest advantages which the electric industrial truck or tractor offers for use in printing plants is that it eliminates a large amount of rehandling. Almost every time paper is handled a certain proportion of it is lost due to the fact that it is soiled in the operation. In large establishments the amount lost in this way is considerable and rehandling is avoided wherever possible. Where an electric is used this rehandling is reduced to a minimum, for the stock can be loaded in large quantities on skids or trucks and left to be transferred by the electric without any loading or unloading.

Another decided advantage is the ability of the electric to keep the stock moving and keep the machines supplied with work. It is not necessary for the operator to stop his machine to wait for supplies or go after them himself. This provides a maximum of production efficiency with a minimum of lost time. The printers are also better satisfied for they are not called upon to do any extra hard work and they can keep at the work for which they are specially employed.

As a means of solving the labor problem the electric also offers many advantages. Labor nowadays is not only high in cost but very hard to maintain. It will not perform the strenuous work it formerly would. In addition to relieving the workmen of the harder and more difficult tasks the introduction of an electric also has a certain moral effect that causes the men to be more contented and satisfied; for it is an indication from the management that it endeavors to relieve them of the hard work and its dangers of developing hernia and causing accidents. Those that are employed can also be paid higher wages without increasing the handling expense to any extent. As a result a better and more efficient class of workmen can be maintained which will do away with many of the labor troubles encountered and the losses due to excessive labor turnover.

Crowded and Congested Aisles Are Typical of Printing Establishments—This One Is Exceptionally Clear—They Can Be Kept Even More Clear Where Electric Handling Equipment Is Used.

Central-Station Rates in Theory and Practice

Twenty-First Article—Geometrical Analysis of Rate Schedules—Principles of Three-Dimensional Representation of Rates—Typical Examples Using Solid Models

By H. E. EISENMENGER

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This series of articles, of which the present is the twenty-first, was begun in the issue of July 12. Part I consisted of seven articles on the cost of electric service. Part II included six articles on the general principles governing the choice of a rate system. Part III contained six articles describing various rate systems. In Part IV, of which this is the second half, it is shown how rate systems can be analyzed. The remaining four articles will constitute Parts V and VI, dealing respectively with accuracy of rates and the current practice of rate regulation by utility commissions.

PART IV—RATE ANALYSIS—Continued.

II. Geometrical Rate Analysis.*

SECTION 164. A rate system is nothing but a statement of the way in which the amount to be paid by the customer varies with his maximum demand and with his energy consumption.[1] We have therefore three variable amounts: the maximum demand d, the energy consumption e and the amount of the bill a. Some rate systems do not take cognizance either of the demand or of the energy consumption (pure meter rates and flat demand rates, respectively). In those cases we have therefore only two variables and we can demonstrate the way in which one of the two variables depends on the other one, by a graphic representation in a plane (see Figs. 4 and 5). If we want to extend the graphic representation to rates that are based on both demand and energy consumption we must add a third dimension. The rate will be represented by a surface in space or in other words by a solid model.

To explain this more fully: In Figs. 4 and 5 we stepped off the energy consumption to a certain scale in horizontal direction and the amount of the bill in vertical direction. We had, as it is termed, two *axes* standing normal upon one another. Now we will have to add the demand in another horizontal direction (assuming this page to be held vertically in front of the reader) normal to the direction in which the energy consumption has been stepped off, that is normal to the plane of the paper. We thus get three axes OA, OD and OE, of which each one stands normal to the two others, like three edges of a cube which meet in one point (Fig. 9). Given now a customer with a certain demand d and a certain energy consumption e, we choose a scale for the demand, for instance we say that every inch shall represent 10 kw. We then measure off the number of inches which corresponds to the given demand d from o in the direction towards D. Let this length be Od and we thus arrive at the point d. From this point we draw a parallel to OE, shown as DE' in Fig. 9. In the same manner as above we choose a scale for the energy consumption and step off on the parallel dE' the length dP corresponding to the energy consumption of the customer. We thus reach the point P.

Point P is called the characteristic point of the customer. As soon as the customer changes either his demand or his energy consumption, or both, his characteristic point will shift to another position. Fig. 10 shows the bottom plane ODE viewed vertically downwards from above. If we connect P with the origin O by a straight line all customers whose characteristic points are situated anywhere on this line (or its production beyond P) evidently have the same load-factor e/d as the customer with the point P. The smaller the angle λ is the smaller is the load-factor of all the customers whose characteristic points lie on that line. For the load-factor $l = e/d = 0$ the angle $\lambda = 0$, but for $l = 100\%$ the angle λ is not 90° as might be expected on superficial observation, but it reaches a certain maximum value λ_{max} which is smaller than 90°. Just how large it is depends on the scales which have been chosen from d and e, but it must of necessity always be smaller than 90°.

If we step off now in the vertical direction from the characteristic point of a certain customer the amount a (to a certain scale which we are free to choose) we get a point in space above the plane (Q in Fig. 9). The position of this point in space determines the customer's demand, his energy consumption, and the amount he has to pay for both, under the system of rates under investigation.

*The principles of geometrical rate analysis were first brought out by the author in the 1911 report of the National Electric Light Association Rate Research Committee.

[1]Engineers and other readers who are more familiar with mathematics may skip Section 164, and substitute the following briefer statement in lieu of the same: Mathematically expressed a rate system is nothing but the function $a = f(d, e)$. This function contains three variables a, d, and e so that three dimensions are necessary for a graphical representation. Demand d and energy consumption e are used for the horizontal axes of an orthogonal system of axes in space and the amount a is stepped off in the vertical direction. We thus get a surface in space representing the function $a = f(d, e)$. The surface and the rate determine each other.

Every customer is characterized by his "characteristic point" P on the bottom plane. The co-ordinates of this point are the customer's demand and energy consumption. The locus of the characteristic points of all customers with the same load-factor is a straight line drawn from the origin at an angle λ with the axis of d, where $\tan \lambda$ is proportional to the load-factor l. Consequently where $l = 0$ this line is identical with the d-axis, whereas for $l = 100\%$ it is not identical with the e-axis, but includes a certain angle λ_{max} with the d-axis. The size of λ_{max} depends on the relation of the scales for d and e. Any portion of the bottom plane as well as of the surface in space for which $\lambda > \lambda_{max}$ has no meaning in practice.

Now all rate systems, with practically no exception, are of such a nature that the function $a = f(d, e)$ is of the first order so that the surface representing the rate is a plane, at least for all customers within a certain range of demand and energy consumption. For other ranges we get another function for $f(d, e)$ which also, however, is of the first order so that the surface for all customers is a combination of planes.

If we now do the same thing as just described for every point on the bottom plane the upper ends of all the vertical lines will form a surface in space which determines and represents the demand-energy rate in the same manner as the plane curves of Fig. 4 or 5, for instance, represent pure meter rates. Instead of the surface we can also speak of the total space between the surface and the bottom plane, that is of a solid or of a solid model, always meaning, of course, in this case the upper surface of the model.

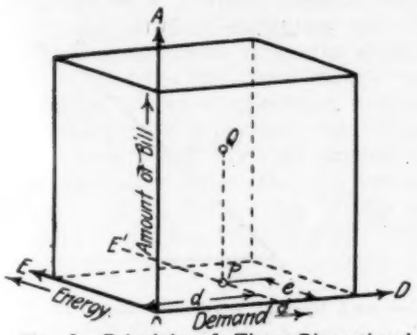


Fig. 9.—Principle of Three-Dimensional Rate Representation.

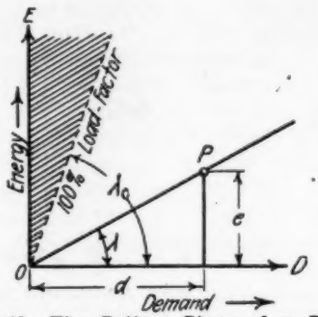


Fig. 10.—The Bottom Plane of a Rate Model.

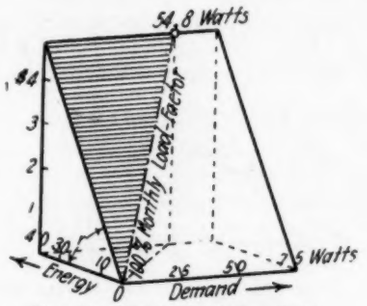


Fig. 11.—Straight Meter Rate.

A few examples will make this clearer.

165. One of the simplest cases is the straight meter rate. The charge is proportional to the energy consumption and independent of the demand. This rate is obviously represented by a plane passing through the demand axis and sloping at a certain angle r from the bottom plane upwards. Fig. 11 is, for instance, the model of a 12-cent per kw-hr. rate.

In designing a model of a rate we have first to decide over what portion of the bottom plane the model is to extend. Fig. 11, for instance, extends over the range from 0 to 75 watts demand and from 0 to 40 kw-hr. energy consumption. At $e = 40$ kw-hr., that is, at the rear end of the model the amount to be paid is $12 \times 40 = 480$ cents ($4.80) for any demand d.[2] The part of the solid which corresponds to load-factors of more than 100%, and which therefore has no practical meaning, is shaded in the drawing of this and the following models. It is found in the following manner: For 40 kw-hr., for instance (rear plane of the model) we have 100% load-factor (730 hours' use per month) at $d = 40{,}000$ watt-hours/730 hours $= 54.8$ watts. Place a vertical plane through this point and the origin O; the line of intersection of this plane with the surface of the model is the 100% load-factor line.

A similar surface or solid would represent a flat demand rate except that this model would have to be turned around by 90° with respect to the former, see Fig. 12.[3]

Supposing now that we have a Hopkinson rate, then it becomes clear that we will get a combination of the planes shown in Figs. 11 and 12. The plane will be in such a position in space that the angle r corresponds to the energy charge and the angle s to the demand charge (Fig. 13). A large energy charge will result in a large angle r and vice versa. The same applies to the relation between the demand charge and the angle s.[4]

The next example is logically the Doherty three-charge rate. The difference from the Hopkinson system is that a customer charge of constant size (to be called x) is added to the charges of the Hopkinson system.[5] This means that the plane of the Hopkinson system will simply have to be lifted up parallel to itself over a distance corresponding to the amount x (to the scale previously chosen) and if the demand and the energy charges are to be lowered the angles r and s will have to be made smaller. The plane or model will assume the general shape of Fig. 14.

166. Without going into theoretical details[6] we will investigate now how the plain Wright demand rate looks in this space representation, for instance a rate charging 10 cents per kw-hr. for the first 30 hours of use and 5 cents per kw-hr. for the balance. Assuming first a customer with a fixed demand of 1 kw. it is evident that the quoted Wright rate will be

[2]By mathematics: $a = f(d, e) = ze$, that is the equation of a plane passing through the axis of d and sloping at an angle r from the bottom plane, where tan $r = z$.

[3]Mathematics: $a = f(d, e) = yd$, that is the equation of a plane passing through the axis of e and sloping at an angle s from the bottom plane, where tan $s = y$.

[4]Mathematics: The equation of the plane in space is $a = yd + ze$. (It should be remembered that the co-ordinates are here not called x, y and z, as usually, but d, e and a, respectively, whereas x, y and z are co-efficients). The trace on the a-d plane of co-ordinates is found by setting $e = 0$ in this equation, resulting in $a = yd$. Likewise the trace on the a-e plane is found as $a = ze$. These two traces rise therefore at angles r and s from the horizontal which are determined by tan $r = z$ and tan $s = y$. The traces determine the position of the plane in space.

[5]Of course, if this shall not simply mean making the rates simply so much higher to every customer, the kilowatt-hour charges or the kilowatt charges, or both, will have to be lowered, just as the kilowatt-hour charges of a straight meter rate have to be lowered if we change over to a Hopkinson rate by adding a demand charge.

[6]For these see the author's article on "Space Representation of Central-Station Rates," *Electrical World*, Nov. 4, 1911.

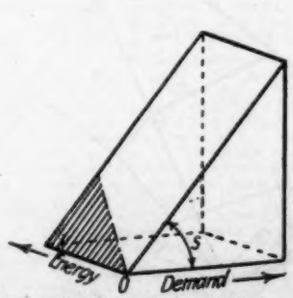


Fig. 12.—Flat Demand Rate.

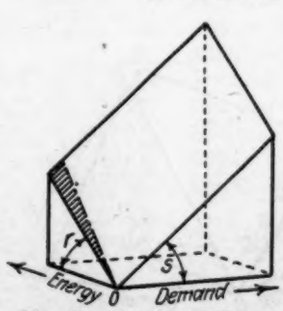


Fig. 13.—Hopkinson Rate.

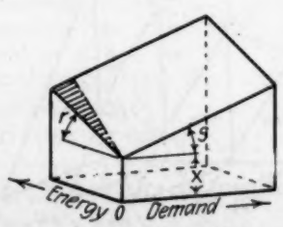
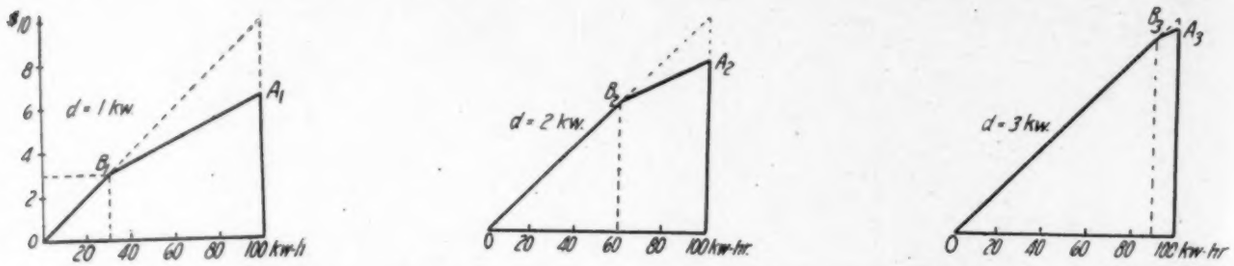


Fig. 14.—Doherty Rate.

a block meter rate for all such customers (demand 1 kw.) charging 10 cents per kw-hr. for the first 30 kw-hr. and 5 cents per kw-hr. for the excess (See Fig. 15a, also Insert XII). For every customer with 2 kw. demand the Wright rate is the equivalent of another block meter rate, viz., 10 cents per kw-hr. for the first 60 kw-hr. and 5 cents per kw-hr. for the excess (Fig. 15b). For 3 kw. demand we get Fig. 15c, etc.



Figs. 15a, 15b and 15c.—Wright Demand Rate—Monthly Bills for Various Customers with Various Maximum Demands.

Supposing now that we cut these diagrams Fig. 15a, 15b, 15c, etc., out of stiff cardboard and arrange them behind one another in proper order and at distances from each other corresponding to 1 kw., as shown in Fig. 16. The interstices between these cardboards are then filled in by more cardboard diagrams representing the rate for customers with fractional-kilowatt demands, for instance 1½ kw., then 1¼ and 1¾ kw., etc., at the proper spacing, until we finally get a solid block of cardboards (Fig. 17). Then this block evidently represents the space model of the rate. Every point on the bottom plane is determined by the customer's demand and energy consumption and the vertical distance from there to the upper surface is the amount paid by the customer.

This surface consists of two planes *ODB* and *OBAF* which intersect in the straight line *OB*. Plane *ODB* represents a straight meter rate. *OBAF* is a Hopkinson plane (compare Fig. 13), as can be easily seen if we produce that plane until it intersects the vertical plane passing through axis *OD* (point *E* and dot-and-dash lines in Fig. 17). The line of intersection *OB* between the two planes where the 5-cent charge begins, corresponds of course to the 30-hour load-factor, this means that if we project it down on the bottom plane we get the 30-hours load-factor line.[7]

To construct this model the simplest way will be to proceed in the manner indicated above by the cardboard diagrams. We would place the last cardboard $D_2B_3A_3$ at the proper distance from the origin *O* (Fig. 17) and pass the plane *ODB* through *DB* and the point *O* (primary plane) and then pass *OBAF* (secondary plane) through *O* and *AB*, or through *O* and *AF*. A check of the correctness will hardly be necessary in this simple case, but we could check whether the secondary plane *OBAF* actually is identical with the Hopkinson plane as computed.

167. Turning now to a somewhat more complicated example, that of the St. Louis Residence Lighting rate, described and partly discussed in Section 161, we have in range 1 (see Fig. 8) a straight meter rate, of course. Ranges *2a* and *3a* have been found by the algebraical analysis to be represented by Hopkinson planes. The rate schedule is therefore equivalent to a simple three-block Wright demand system for all customers whose demand element does not exceed 4 rooms. If the demand is greater than 4 rooms, we have in range *2b* a Doherty plane (see the inscription in range 2b of Fig. 8). This plane may be constructed in several different ways, one of which is this: The point of the rate surface corresponding to point *A* in Fig. 8 must be a point of the plane under construction. It belongs to range 1 as well as to range *2b* (and incidentally to *2a*). The number of rooms corresponding to this point is 4, consequently the number of kilowatt-hours is 4×4 because the point lies on the dividing line. The amount to be paid is $4 \times 4 \times 12 = 192$ cents,[8] computed from range 1. We have thus located one point of the plane for the range *2b* and in an entirely analogous way we can determine two more points of the plane, for instance those corresponding to *B* and M_1 of Fig. 8. Points on the dividing lines are of course preferable because they can be used for the determination of more than one plane and thus the work is simplified.

The whole model of the St. Louis residence rate (modified as per footnote 8) looks like Fig. 18.

168. The stipulation of a minimum bill in a rate schedule means that, whatever the rate surface may

[7] The mathematics of the case is as follows: Call p the primary charge in cents per kw-hr. and s the secondary charge and let l be the load-factor up to which the primary charge applies. Then we have in the primary range $a = pe$ and in the secondary range $a = pld + s(e - ld) = (p - s)ld + es$. This means, in the secondary range we have a demand charge of $(p - s)l$ and the energy charge is s cents per kw-hr. We will therefore have in the primary range a straight meter plane and in the secondary range a Hopkinson plane with $\tan r = s$ (secondary energy charge) and $\tan s = (p - s)l$.

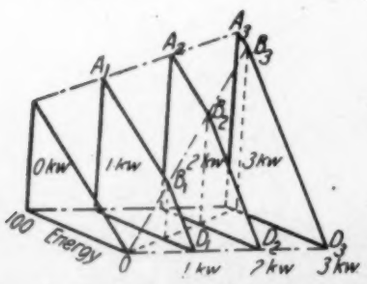


Fig. 16.—Evolution of Model of Wright Demand Rate.

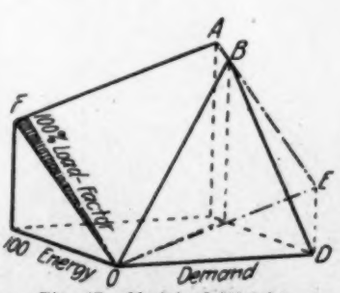


Fig. 17.—Model of Wright Demand Rate.

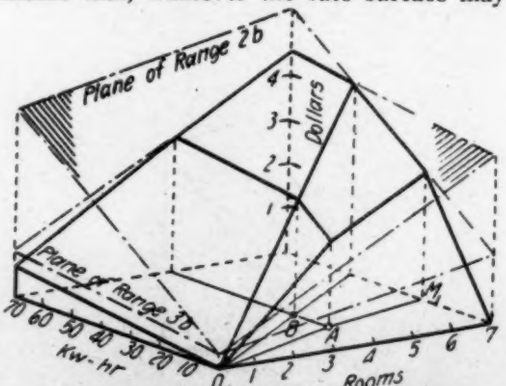


Fig. 18.—Model of Number-of-Rooms Rate (12-6-1c/kw-hr.).

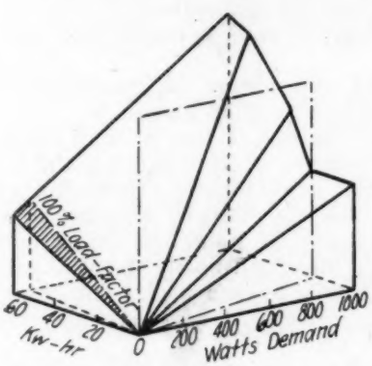
be, no parts of it shall be considered which are nearer to the bottom plane than the distance corresponding to the amount of the minimum bill. We therefore draw a horizontal plane at that distance above the bottom plane and wherever that plane is higher than the surface of the model it replaces the latter. To demonstrate how this works out, Fig. 19 shows a model of a Wright demand rate[9] with a minimum charge (of $1), indicating also in the ground plane Fig. 19a in which range the minimum bill applies.[10]

Fig. 20 is the same Wright rate with the stipulation of a certain minimum number of kilowatt-hours instead of a minimum bill. Suppose, for instance, the rate would say that, whenever the actual energy consumption is less than 20 kw-hr. it shall be figured as being 20 kw-hr. for billing purposes. Then we have to draw a vertical plane $PQQ'20$ normal to the axis of energy and at a distance from the origin O zontal line parallel to the energy axis. All these horizontal lines together then form a set of planes $pp'q'q$, $qq'r'r$ and $rr's's$ (Fig. 20) which determine the minimum charge. Fig. 20a shows the range of the minimum charge in this case.

We see from this at once the difference between a minimum bill and a minimum number of kilowatt-hours for billing purposes (see end of Section 108).

The stipulation of a minimum demand which is also sometimes found in practice results in an analogous set of planes to those shown in Fig. 20, but on the kilowatt-hour side of the model instead of on the kilowatt (or watt) side.

The stipulation of a minimum load-factor to be taken into account for billing purposes results (with the same simple Wright demand schedule) in a model like Fig. 21 (no load-factor considered for billing purposes smaller than 20 hours' use per month).



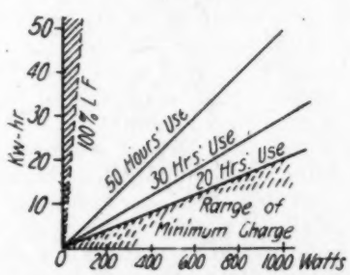
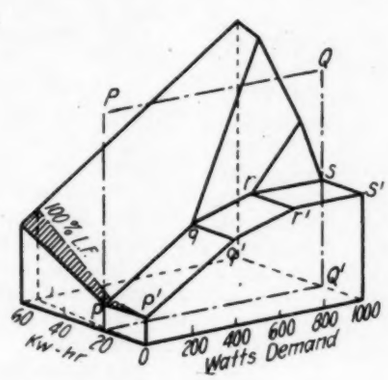


Fig. 19.—Minimum Charge.
Fig. 19a.—Plan of Fig. 19.



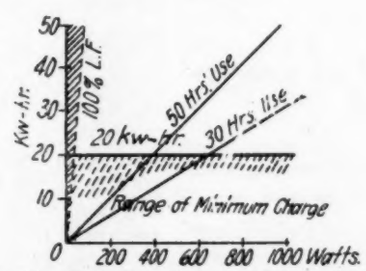
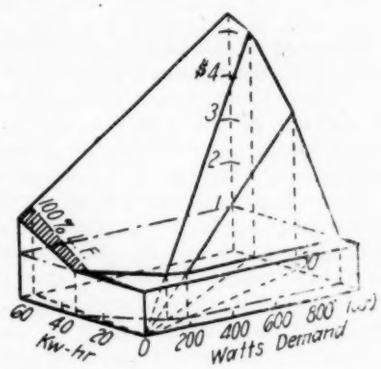


Fig. 20.—Minimum Energy Consumption.
Fig. 20a.—Plan of Fig. 20.



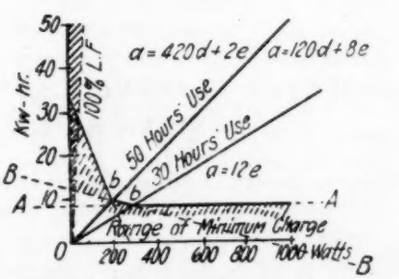


Fig. 21.—Minimum Load-Factor.
Fig. 21a.—Plan of Fig. 21.

which is equal to the stipulated minimum number of kilowatt-hours (20 kw-hr. in our example). From every point of the line of intersection between this vertical plane and the rate surface we draw a hori-

It requires no further detailed explanation to show how a combination of minimum charges expresses itself in space representation. For instance, it may be stipulated that under the Wright schedule just discussed (Figs. 19 to 21) the minimum number of kilowatt-hours to be paid must correspond to a monthly use of the maximum demand of at least 20 hours, and that moreover no bill shall be made out at less than $1. The two minimum-charge steps of Fig. 19 and Fig. 21 will then combine in such a manner that that step applies which is the higher one of the two at the respective point of the bottom plane, in other words on the left portion of the model (small demands) the $1 minimum step (Fig. 19) will apply and for larger demands the load-factor-minimum applies. The demand at which the two "minimum" steps intersect one another can be found either graphically or by computation as

$$d_1 = \frac{\text{100 cents per month}}{\text{12-c/kw-hr.} \times \text{20 hours per month}}$$

$$= 0.4166 \text{ kw.} = 416\ 2/3 \text{ watts.}$$

169. Fig. 22 shows a model of the rate referred

[9]To exhibit more plainly the characteristic qualities of this type of rate, the St. Louis rate has been arbitrarily modified for the construction of the model Fig. 18 from a 8-6-3-cent rate to a 12-6-1-cent rate which makes the angles between the various planes greater. The ground plane is unchanged.

[9]Assumed charges are 12 cents per kw-hr. for the first 30 hours' use, 8 cents per kw-hr. for the next 20 hours' use and 2 cents per kw-hr. for the excess.

[10]This range in which the minimum bill applies can be found either graphically from the tracing of the model itself or, if greater accuracy or a check would be required, it can also be computed, in the following way:

In the primary range where $a = 12e$ we get by setting $a = 100$ cents, $12e = 100$ and $e = 100/12 = 8\ 1/3$ kw-hr.; this means a straight line AA (Fig. 19a), normal to the axis of energy consumption (kw-hr.) and at the distance 8 1/3 kw-hr. from the origin. In the secondary range we have the equation of the rate surface $a = (12 \times 30d) + 8(e - 30d) = 120d + 8e$ and setting this = 100 cents we get $120d + 8e = 100$. This is the equation of the straight line BB in Fig. 19a. The portion bb between the 30-hour and the 50-hour load-factor lines determines the range of the minimum charge in the secondary range of the rate. To construct this line $120d + 8e = 100$ we find its intersection points with the axes of abscissae (watts) and of ordinates (kw-hr.) by setting first $e = 0$ and then $d = 0$. $e = 0$ gives $120d_0 = 100$ or $d_0 = 100/120 = 0.8333$ kw. = 833 1/3 watts on the axis of demand. $d = 0$ results in $e_0 = 100/8 = 12\ 1/2$ kw-hr. on the axis of energy consumption. In analogous manner we can find the range of the minimum charges in the tertiary range of the rate.

to and analyzed in Section 163. It demonstrates clearly how the plane for load-factors above 300 hours (plane *OST*) slopes in the wrong direction so that a negative angle *s* (that is, a negative demand charge) results.

170. Only simple rates have been dealt with here as far as their space representation is concerned. The more complex a rate system is the greater is the

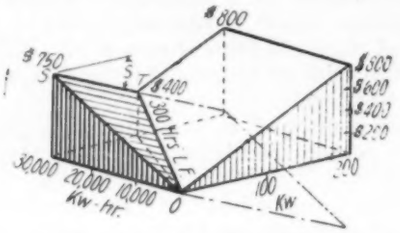


Fig. 22.—Negative Demand Charge.

advantage of a graphic representation for a clear insight into the meaning and the character of the rate.

More about this system of rate representation is contained in the author's article on "Space Representation of Central-States Rates" in the *Electrical World* of Nov. 4, 1911, which also contains many examples of various kinds of rates and numerous photographs of a large number of actual models of rates as had been made for the purpose of investigating these rates. It is, of course, not strictly necessary to have the models actually made in three dimensions. A good axonometric drawing, of the type of Figs. 17 to 22, or even pure imagination how the model looks, will also prove very helpful.

(To be continued.)

PROPOSED ELECTRIFICATION OF SOUTH AFRICAN RAILWAYS.

Experts Report to Union Government on Advantages of Conversion and Estimated Financial Results.

A London firm of consulting electrical engineers (Merz & McLellan) has submitted a report to the Union Government of South Africa on the possibilities and advantages of the electrification of certain sections of the South African railways. The sections of the railways considered for electrification are confined to four divisions.

The first comprises the main line from Cape Town to Touws river and suburban lines in the peninsula. A tabular statement, giving the cost of electrification and the profit, shows an estimated return on the net capital outlay of 1½% on the main line section, 10% on the Simonstown branch, 8.1% on the Sea Point line, 30.5% on the Docks branch, and 9.7% in the Docks area.

The second section comprises the Natal main line from Durban to Glencoe, on which a return of 40.3% is anticipated, and the Glencoe-Vryheid East branch with a return of 12.5%.

The third section is the Witbank-Germiston-Randfontein line, on which the return is estimated at 10.8%; while the fourth section is the Delagoa Bay line between Witbank and Komatipoort, and here the return is expected to be 5.6%.

Thus the conversion of the main line in Natal is by far the most profitable. This is to be expected on account of the density of the traffic and the very severe nature of the line, both of which tend to make operation of the line very difficult. The introduction of electric traction would avert the necessity for double-tracking the line, the traffic on which is approaching the limit of capacity for a single track.

This scheme embraces a route mileage of approximately 650 miles, a single-track mileage of nearly 1015 miles, with certain additions for sidings, etc.

A number of the advantages to be derived from the conversion are enumerated. They include:

(1) A higher average speed for long-distance passenger trains.

(2) An increase in the weight and a reduction in the number of freight trains, with a consequent improvement in the handling of traffic.

(3) Postponement of the necessity for doubling the track.

(4) Reduction of wear and tear on the permanent way.

(5) Elimination of the costs connected with the supply of water and coal for locomotives.

(6) Increased comfort for passengers and train crews.

(7) Abolition of expenditure in compensating farmers for fires caused by engine sparks.

As it is out of the question to take in hand simultaneously the whole scheme of electrification, the report recommends that steps for the conversion of the line between Durban and Glencoe be started immediately, then successively the Rand line, the Vryheid East branch, the Cape lines, and finally the Witbank-Komatipoort section should be electrified. The direct-current system and overhead transmission are recommended.

For main-line traffic it is proposed to use freight locomotives with a tractive effort of 48,000 lbs., compared with 53,750 lbs. of the present Mallet articulated type, and passenger locomotives with a tractive effort of about 30,000 lbs., which would be capable of hauling a 600-ton load up a gradient of 1 in 60.

In view of the fact that with electric working the most economical condition is obtained when the train travels at the highest possible speed, it is proposed to increase very substantially the general speed of the freight traffic. Provision would be made for a speed of 20 to 23 m.p.h. up the ruling gradients by freight trains, and 28 to 29 m.p.h. for passenger trains, as tending to the most economical working, while for level parts provision would be made for an express passenger locomotive to haul 15 main-line coaches at not less than 55 m.p.h.

A comparison is made with a test made with a locomotive of the 12th class on a run from Witbank to Germiston, which covered the distance in 3 hrs. 45 min., exclusive of stops, whereas an electric locomotive would take 2 hrs. 40 min.

The report does not anticipate any substantial gain from the utilization of water power for the generation of energy. It suggests for the Natal lines the erection of power stations at Durban and Tayside, near Glencoe. For the Rand line power might be taken partly from a station on the Great Olifant's River and partly from the existing network of the Victoria Falls Co. For the eastern line a power station should be provided at Komatipoort, and for lines radiating from Cape Town there should be a power station near Cape Town and another at Touws River. At Cape Town a combined station is suggested capable of developing power for railways, tramways and municipal requirements.

The proposed new service provides for an increase of 66% in train mileage on the ordinary week day.

Effect of Strike Upon Central-Station Supply to Coal Mines

Consensus of Opinion Foretells Higher Demand, Greater Energy Consumption and Increased Electrification — Central-Station Supply to be Encouraged—Other Effects

ELECTRIFICATION of coal mines has progressed steadily for many years, the rate being accelerated from time to time by such factors as high market value of coal, high cost of labor or its scarcity, and increasing necessity for efficient mining of coal. Many central stations have found the supplying of power to coal mines a profitable form of load. The coal operators have found central-station service equally profitable. The plan is mutually profitable.

Under these circumstances there has been every reason to expect that more and more coal mines would go over to central-station service in preference to operating their own isolated and inefficient plants. The conditions that may be created by the cessation of the bituminous coal miners' strike, which will be brought to a cessation by a compromise the details of which are not yet known, immediately cause one to ask as to the effect of the new conditions upon the central stations already serving coal mines and those that purpose to do so.

The miners originally demanded a 60% increase in wages, a 6-hour working day, the working day being considered as commencing from the time they started down the mine shaft to the time at which they emerged, and a 5-day week. There is every reason to believe, however, that a compromise will be made by increasing wages 30% or so, the coal operators guaranteeing more regular work, but insistence being made that an 8-hour day be retained. The question then that central stations already supplying coal mines are asking themselves is, whatever be the result of the strike, how will that result affect them? Likewise, utilities that have been looking to the coal mines as a potential load are concerned as to whether the new conditions soon to come about will help them or hinder them in taking on coal mines. There is every reason to believe, and this belief is backed by the opinions of a large number of central stations, that whatever the outcome, whatever the compromise between the striking bituminous miners and the coal operators, there will be added incentives for the coal operators to purchase central-station service.

The Penn Central Light & Power Co., located at Altoona, Pa., serves a territory where coal mining constitutes an active and extensive industry. The company operates two steam plants of its own and also purchases considerable energy from an interconnected hydroelectric system. Considerable energy is supplied for coal-mining operations, hence this company is closely interested and well versed in this phase of central-station supply.

Speaking of the result to be expected, should the bituminous coal miners gain their demands for a 6-hour day and a 5-day week, and not taking into cognizance the aspect of higher rate of remuneration, J. H. Shearer, general superintendent of the company, points out that the consideration of the immediate effect of capitulation to the miners' demands should be divided into two catagories; the first of these embraces haulage, the second ventilation.

"The country cannot get along on any less production than it is at present, in fact, we need considerably greater production," says Mr. Shearer. "The 6-hour day would, of course, mean a reduction in tonnage and, in order that the coal operators could maintain sufficient tonnage to meet the demand, they will undoubtedly resort to the electric mining machine in mines where the seam is so arranged that mining machines can successfully be applied. By maintaining the tonnage in this manner, the annual kilowatt-hours used for haulage will, in our opinion, remain practically constant, since a given tonnage can be hauled over a certain distance under a certain number of kilowatt-hours used.

"It will require heavier trips under a 6-hour day than under the 8-hour day, which will mean a higher demand on the machines handling the haulage which reduces the load-factor of the installation, thus producing a greater income from the kilowatt-hour to the power company selling the service on a load-factor basis.

"In connection with the ventilation of the mine, we see that the kilowatt-hours will be reduced, since the fans in many mines could be slowed down to half speed two hours earlier than at the present; this will also reduce the load-factor with corresponding effect on power cost. We believe, however, that the kilowatt-hours used by additional mining machines will go a long way to overcome the reduction in the kilowatt-hours required for ventilation, if not exceeding them. Should a mine be a gaseous one where it is necessary to keep the fans running 24 hours a day at full speed, there will be no reduction in kilowatt-hours used in ventilation due to the 6-hour day, and the additional kilowatt-hours used for mining machines will increase the present kilowatt-hours.

"Power for pumping could not be taken into consideration as to working hours as this function is necessary according to weather and water conditions.

"We, therefore, feel that a 6-hour day would ultimately mean an increase in the use of power over the present requirements, but there would be a period of reduced production and kilowatt-hours used immediately after the mines would go on 6-hour shift, and this condition would continue until the mining companies installed the mining machines and the production increased."

The Appalachian Power Co., Bluefield, W. Va., is located in proximity to the Pocahontas, Clinch Valley, Tug River, Winding Gulf coal fields and finds in them a good customer for power. The company has a total generating capacity of about 25,000 kw. and a connected power load of 70,000 kw., indicating a com-

paratively large power load. The coal fields supplied by the company are non-union fields, hence their load has been favorably affected since the strike in union coal fields, partly because of the greater effort put forward by the miners and partly because the supply of railroad cars has enabled a much higher rate of coal production to be maintained. However, if the striking miners win in their demand the company expects conditions in the non-union coal fields to gradually approach those of the unionized fields so that if the latter obtain shorter working hours, the former will eventually also.

The effect of shorter working hours, points out Herbert Markle, general manager, Appalachian Power Co., will be similar in effect to the conditions created during the war by a shortage of labor. In both cases there will be greater incentive for the installation of "machinery of all kinds, and this tendency seems to be increasing." The result is "an increased consumption of electrical power as well as resulting in decreased cost of mining coal, as electrical power is cheaper than man power. As yet coal loading machines are not commercially in use, but some mines are experimenting with this type of equipment, and when perfected, there is no question but what they will be quite generally adopted, as they will go a long way toward solving the labor difficulty."

Practically every one of the large number of central stations expressing an opinion is convinced that the demand per mine will be higher for the reason that effort will be made to maintain production. More tipple and mine working will necessarily be installed, resulting in lower load-factor and higher peak demand. As one power company states, the fact that the men will lose time in getting to work and getting to the surface again after their work, creating in effect a shorter day, taken in conjunction with the fact that effort will be made by the coal operators to maintain production, will tend to cause mine operation to be more regular, and forced cessation such as has occurred so frequently in the past because of inability to obtain railroad cars, will be less a factor in limiting coal production and forced idleness of the men than in the past. Another factor tending toward this is the fact that public opinion and the attention of federal and other bodies has been brought to bear upon this phase of the coal situation.

G. M. Gadsby, vice-president, West Penn Power Co., whose company supplies considerable power to the bituminous coal fields of Pennsylvania, looks for somewhat lower load-factor, higher peak demand and increased consumption of kilowatt-hours if the miners obtain concessions in the way of shorter hours. In part, he says:

"The consensus of opinion is that every possible effort will have to be made to maintain production. This will mean the installation of more tipple and mine working capacity, with the resultant higher peak demand on the central stations and a very much poorer load-factor. The kilowatt-hour output would be changed but little, the result of the 6-hour day being to do in 6 hours what is now done in 8.

"Investment cost of coal produced would necessarily be higher, and since most power rates are based either directly or indirectly on load-factor, the cost of power per ton of coal mined would also be higher.

"It might be of interest here to note that during the shortage in central-station power which prevailed in this district in the war time, all the various agencies who investigated the situation agreed that if the operation of the mines could be spread over a longer period there would have been adequate capacity to serve all desiring this service."

Isolated Plant to Give Way to Central-Station Supply.

Electric power is cheaper than man power, can be more easily controlled and readily changed according to the needs of the situation. While man power is costing more and more and becoming more and more difficult to handle, electric power is of fixed cost, tending toward somewhat decreasing cost, and gives less trouble the larger the quantity handled (because of better provision for its distribution and maintenance for equipment). Higher wages for man power, regardless of any possibility or probability of a shorter effective working day, means increased electrification. The above is the sum-total of the expressions of several public service companies supplying coal-mining regions with electric power.

If the miners' demand for a shorter working day materializes, it is not difficult to see what will be the result. Whatever happens, every effort will be made on the part of the coal operators to maintain the production of coal according to the demand. The shorter working day means that there will be a greater number of hours out of the 24 when the mines will not be actively engaged in mining coal. Coal-cutting machines, locomotives, drills, tipples, etc., will be shut down and only a quota of the fans for ventilation and the pumps for caring for the seepage, etc., will operate. The working load will be heavier than previously while it lasts. There will be a relatively light load for a relatively longer portion of the 24 hours. The influence of the promised load curve upon plant performance and choice of equipment is of interest, as is emphasized by one utility.

Plant efficiency depends upon the load and the load-factor. The operators of coal mines have always in most cases favored central-station supply exclusively. A shorter working day only makes the purchase of service by the mine from the central station even more advantageous for the former, notwithstanding the lower load-factor, as already foretold above by many public utilities. Coal wasted at the mine represents a loss to the mine operator since that same coal has a market value—a value considerably enhanced during the last year or two; therefore, power plant economy becomes of importance. The lower load-factor that will come with the miners' shorter working day means more inefficient operation than ever of the coal operators' isolated plants. The higher peak or demand means a greater investment than was necessary before the strike, another factor favoring the use of central-station service in preference to enlarging the existing isolated plants.

Many coal mine operators have found it profitable in the past to purchase their electric power. Higher wages coupled with a shorter effective working day will mean many more operators will go over to central-station service. One utility manager voices the opinion that there will be almost a stampede in the endeavor to connect up to the transmission line in preference to making isolated plant extensions to meet conditions that are at best inefficient.

The shorter the time in use, the fewer the hours out of the 24 that equipment is in use, the more important it becomes to keep to a minimum the investment in plant. This means, according to the manager of a utility in the Middle West serving many coal

mines scattered over a large territory, that the outdoor substation will receive unprecedented attention in preference to any other type. Moreover, the flexibility of certain types of the outdoor station, which enables them to be expanded according to the needs of the mine in the way of power requirements, will solve many difficult problems that will arise if the coal operators capitulate to the demands of the miners for a shorter effective working day.

The consensus of opinion of the central stations supplying mines in the bituminous coal fields, as learned from a large number of replies received in reply to a questionnaire sent out by the ELECTRICAL REVIEW is that the load-factor of the individual mine will be lower; the maximum demand and kilowatt-hours consumed higher; that many coal mines now producing their own power will be forced to go over to central-station supply; and that very many mines will find it necessary to increase their consumption, hence additional electrical equipment for below as well as above ground will have to be purchased. The central stations in general look for increased revenue from coal mines, whatever capitulation be made to the striking miners, whatever the compromise. This will not accrue immediately upon the resumption of work because of a time lag until new equipment can be obtained to counteract the new conditions. But it will come eventually.

CENTRAL STATION'S APPEAL FOR VOLUNTARY COAL SAVING.

Commonwealth Edison Co. Asks Its Patrons to Forego Needless Use of Light and Power—Coal Pile Dwindling.

As the strike of bituminous coal miners drags on, the nation is consuming the supplies of coal on hand. The coal pile of the industrial plant, of the railroads and of the central stations is the buffer that stands between operation and shutdown. Every day the coal piles become smaller. Every day that the coal strike lasts the visible supplies of coal become less.

The central stations have always been great believers in the coal pile. Coal is such an important factor in the business of producing electrical energy that the average central station located any distance from the coal mines has felt it incumbent upon it to store coal in fairly close proximity to its power plants so that should strikes of miners or railroadmen, inclement weather and similar unforeseen emergencies arise, there would be a supply of coal from which to draw until the emergency had passed. Usually the emergency has consisted of bad weather, blockage of traffic, inability to obtain railroad cars and similar occurrences of short duration. Many companies have never found it necessary to use their coal in storage because of necessity. But they maintained coal piles because the possibility of something happening convinced them that to do so was a wise precaution.

The Commonwealth Edison Co. has always kept a very large amount of coal in storage, the coal piles being located at their Fisk and Quarry street stations and Northwest station, with other piles at Clearing and along railroad tracks. These coal piles, comprising nearly 400,000 tons, have been maintained for years but until the present strike occurred the company had never been called upon seriously to fall back upon the supply of coal in storage because there was no alternative. They felt, notwithstanding, that the coal pile was a necessary precaution, a safeguard against something that might occur some time, however remote the possibility. That time has come and the 380,000 and more tons stored in readiness are now being used up at the rate of some 5000 tons a day. The coal pile is the factor that makes it possible to continue service to more than 400,000 customers. At the present rate of consumption the company's coal piles will be depleted in 30 days.

With no compromise yet reached between the coal operators and the miners, the company has taken steps to conserve its coal lest the delay in producing coal again is more protracted than is generally expected. The company has already refused to furnish peak-load service to some customers and it is appealing to its patrons in general to help save its coal supply by not using more power and light than is actually necessary. The accompanying advertisement is being published in the Chicago daily papers in the effort of the company to bring realization as to the seriousness of the situation.

An Appeal to the Public to Help Us Save Coal

Because of its great responsibility to the public and to the business interests of Chicago, the Commonwealth Edison Company feels that it should, at this time, make to the people an exact statement as to its coal supply. The Company supplies electric current in 400,000 Chicago homes and business institutions for lighting, power and elevator service and, moreover, the Company's current is absolutely essential to the operation of many of the food producing and distributing institutions of the city. The inability of the Company to supply current would seriously affect the city's water system, the telephone, telegraph and U. S. mail service, and would stop the operation of all surface and elevated lines.

Realizing this great responsibility, the Company long ago adopted the policy of maintaining a large reserve supply of coal to meet such emergency as the present coal strike. As a result, on November 1st, when the miners struck, the Company's reserve supply of coal in and near Chicago was in excess of 380,000 tons, enough to meet its normal requirements for 50 or 60 days. The Company obtains its coal from Illinois mines, all of which are affected by the strike. This is the twenty-fifth day of the period of non-production from these mines, and during this period the Company has been obliged to draw on its reserve supply. At the present rate of consumption, the Company's reserve supply will be exhausted in thirty days.

In the hope of deferring as long as possible, and perhaps avoiding entirely, the drastic curtailment of the use of electricity which has been found necessary in many of the cities of the middle west, the Company feels obliged to ask the people of the city to economize in the use of electricity, and to stop using it where its use is not absolutely necessary. This means a direct saving of coal. Even if a settlement of the coal strike be made immediately, it will not prevent Chicago's coal situation from continuing to be bad throughout the winter, due to exhaustion of the usual winter stock of coal and inadequate railroad transportation, snow storms, blockades, and general conditions that may be expected in cold weather.

To help in this emergency the surface and elevated lines have agreed, so far as possible, to stop the use of electricity in heating cars. It is believed that this will cause slight, if any, discomfort to the public at this time of the year, and will not affect the general health. It will save hundreds of tons of coal daily.

In the interests of the entire community the Company respectfully requests the co-operation of the citizens of Chicago in this crisis, and especially asks that they stop, as far as possible, the use of electrical energy for display lighting of every kind, and curtail the use of light and power, so that there will be no waste and the present coal reserve of the Company may be made to last as long as possible.

COMMONWEALTH EDISON COMPANY

Commonwealth Edison Co.'s Appeal to Its Patrons to Assist in Saving Coal by Eliminating All Non-essential Consumption of Light and Power.

SHIP LAUNCHED UNDER ELECTRIC LIGHT.

It is interesting to note that the American International Shipbuilding Corp., of Philadelphia, Pa., recently effected the launching of the new 7825-ton capacity steel cargo carrier *City of St. Joseph* at night at its big Hog Island shipyards. The company had installed powerful electric projector lamps to light the path of the steamer. It is said that this is the first night launching which has taken place in this country.

Present Limits of Speed and Output of Single-Shaft Turbogenerators

Importance of Rotor Dimensions—Influence of Ventilation, Temperature, Speed and Mechanical Forces Upon Capacity—A.I.E.E. Paper

By F. D. NEWBURY

Westinghouse Electric & Manufacturing Co.

REDUCED to the simplest terms, maximum output at any speed is attained when slot space is provided for the maximum possible ampere-turns (in either stator or rotor), and core cross-section is provided for maximum possible flux. These conditions require the most effective rotor diameter (or stator bore) and the maximum rotor and stator core length. All factors that limit rotor diameter (or stator bore) or core length have a possible bearing on limiting outputs.

The most effective rotor diameter for a given speed is not necessarily the largest diameter. For maximum output, the rotor should have maximum space for winding and maximum tooth and core section for flux. Obviously, these requirements are antagonistic and the actual design is a balance between slot area and tooth and polar area. Again, as the diameter is increased (with a given speed) there is more room for both winding and flux, but with increase in diameter each pound of copper exerts an increasing centrifugal force and the ratio of slot area to tooth cross section must be decreased in order to keep within desired stresses. Beyond a certain peripheral velocity, ampere-turns must be decreased, in spite of the increase in available space, and the most effective diameter has been passed. It is seen, therefore, that in order to obtain maximum output at a given speed, the rotor proportions must be chosen to properly balance mechanical stresses, rotor ampere-turns and flux.

Turbogenerator design has settled down to one type of rotor, so far as form is concerned. This is the so-called radial slot type, in which the ends of the winding project beyond the core body. This construction is shown in Fig. 1, indicating the slot arrangement. This type of design requires solid rings of very good material for holding these projecting coil ends. The hoop-stress in the coil retaining rings is an important limit to output and is, in fact, a more important limit than the tooth stress in the main rotor body.

In a large-diameter low-speed turbogenerator (1200 r.p.m. and below) it is generally possible to employ a larger rotor diameter and more rotor ampere-turns than can be properly balanced by stator ampere-turns. The density of stator ampere-turns is limited by the ability to dissipate heat (with permissible temperature differences) and by the permissible concentration of ampere-turns in a single slot. Obviously, there is no such rigid limit to weight or depth of copper in a single slot in the stator as is imposed by centrifugal stresses in the rotor, but there is a limit to the depth of stator slots determined by the rapid increase in eddy current losses with deep slots and by the ability to construct and insulate long coils having a very large ratio of depth to width.

Thus, in certain cases the rotor is the limiting member and in other cases the stator is the limiting member. In general, the rotor first reaches its limit in ratings of 1500 r.p.m. and higher speeds, and the stator first reaches its limiting output in ratings of 1200 r.p.m. and lower, considering commercial frequencies.

It is apparent that unless the ratio of rotor ampere-turns to stator ampere-turns is a fixed design relation, all generators could be designed for the maximum possible output as determined by the stator, and the rotor need never be the limit. As a matter of fact, there is a tendency in this direction, the restraining fact being that as the field is weakened, relatively to the armature, the increase in field current and exciting voltage as the load is increased becomes greater. A reasonable limit to increase in excitation with load is desirable from the standpoint of voltage regulator operation. Regulators can readily handle a range of one to two or one to two and a half and large generators are proportioned to meet this ratio of no-load to full-load excitation. Voltage regulation has ceased to be a limit to output. These field and armature proportions result in regulations of roughly 25% at 100% power-factor, and 40% at 80% power-factor. Obviously, such regulations could not be tolerated if regulation were a factor in operation.

A fundamental difficulty in laying down definite limiting outputs is the difficulty in arbitrarily stating limiting stresses. The two principal stresses in the radial slot rotor are the tooth stresses in the main rotor body and the hoop stress in the coil retaining rings. Soft carbon steel is employed for the main rotor body and a good quality ductile alloy steel (usually chrome-nickel or chrome-vanadium) is used for the coil retaining rings. Turbogenerators are designed for a maximum speed 20% above the running speed. At this over-speed, the tooth stresses should be approximately one-fourth the ultimate strength of the carbon steel and the coil-retaining ring stress should be approximately one-third the ultimate strength. This results in working stresses, in both cases, approximately half the yield point. It is important that the material be ductile; carbon steel with proper working can readily be obtained with 22% elongation and 35% reduction in area and the alloy steel should have 22% elongation and 50% reduction. These figures refer to standard 2-in. test pieces under tension.

American design practice has established 400 ft. per sec. as an upper limit of peripheral speed for maximum ampere-turns and output for rotational speeds of 1500 r.p.m. and higher. This, of course, assumes existing rotor materials and factors of safety.

It is apparent that having increased the rotor diameter to the most effective value, output will be proportional to the length of the rotor and stator

cores and maximum output will be secured when the length is increased to its limiting value. This limit to length is even more a matter of opinion and judgment than is the limit to rotor or stator diameter. It is determined mainly by cooling air requirements, by bearing proportions, by limits to weight imposed by transportation facilities and the ability to secure forgings of necessary diameter and weight.

Ventilation.

The generator losses, and consequently the required volume of cooling air increase almost in proportion to the core length. In the simple radial or air gap system of ventilation, shown diagrammatically in Fig. 2, all of the cooling air must pass through the air gap entering the annular openings between stator and rotor at the two ends of the generator. The radial dimension of the air gap is constant with constant rotor diameter, consequently volume of cooling air can only be increased as core length is increased by increasing the air pressure. Also, as core length is increased, the diameter of the shaft extension of the rotor body must be increased and the fan intake becomes restricted. In the axial system of ventilation, illustrated in Fig. 3, the stator ventilation is taken care of independently of the air gap and the requirements as to cooling air become less important from the standpoint of limiting output. But with either system of ventilation, designers are already finding it

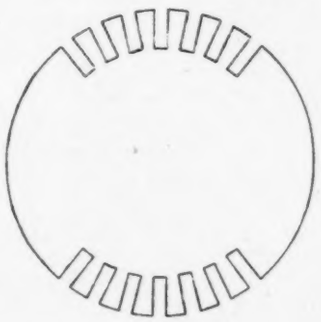


Fig. 1.

necessary to devise more complicated systems in order to take care of 3600 and 1800-r.p.m. ratings now in prospect.

Rotor Deflection.

As the core length is increased, necessitating an increased distance between bearings, the rotor deflection increases. This increases the reversing stress in the shaft material at the journals and reduces the value of critical speed. As the core length is increased the journal and bearing sizes must be increased in order to keep the shaft stress and the critical speed within desired limits and a limit may be imposed by bearing losses and temperatures.

Winding Temperatures.

The limiting ratings given in this paper are based on 150 deg. total rotor winding temperature and from 125 deg. to 150 deg. total stator winding temperatures. It is not probable that ratings will be increased by increasing these temperature limits. Higher temperatures would be of most value in connection with the rotor winding since the rotor limits rating in the two and four-pole designs commonly used. But temperatures higher than 150 deg. result in relatively little gain in rotor ampere-turns on account of the rapid increase in resistance of the winding. If the rotor winding temperature rise is assumed proportional to the loss, an increase in operating temperature from 150 deg. to 250 deg. (an increase in measured rise from 100 deg. to 200 deg.) results in an increase in ampere-turns of only 25%. Thus doubling the tem-

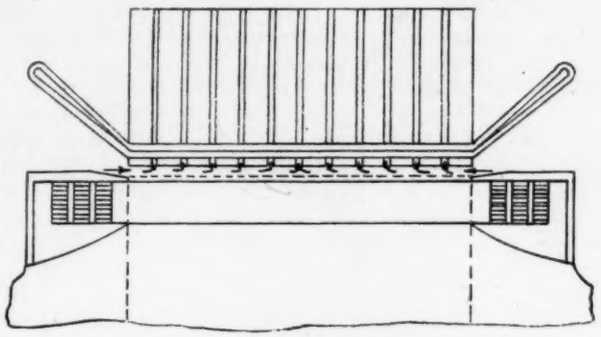


Fig. 2.

perature rise and rotor loss results in a gain of only 25% in output.

Temperatures much above 150 deg. in connection with very long rotors are not considered favorably on account of the danger of trouble from "creeping" of the winding caused by linear expansion.

Transportation Facilities.

Transportation facilities may impose a limit to size in the case of six and eight-pole, 60-cycle generators. With the larger two-pole, 25-cycle and four-pole, 60-cycle generators now being built, the stators are now too heavy for convenient handling and transportation, and they are assembled in place at the power station. Rotors, from the special nature of their design and the special skill and equipment required for winding and assembling, should be completed at the builder's factory and shipped as a unit. The weight of the complete rotor of a four-pole, 1800-r.p.m. generator of 40,000 kv-a. capacity will be roughly 90,000 lbs. This can be transported without difficulty, but the largest possible 1200-r.p.m. rotor would weigh more than 200,000 lbs. and would require rolling stock and trackage (in some cases) not now available.

Another general limitation to output that applies to the larger diameter rotors is that imposed by the forging facilities of the country. At the present time

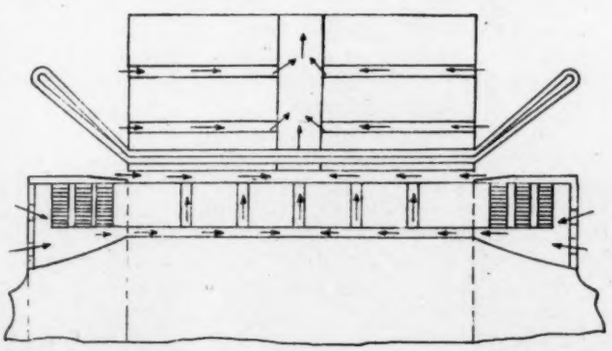


Fig. 3.

it is not possible to obtain forgings of suitable physical characteristics weighing more than 50 to 60 tons nor much larger than 50 ins. (assuming a minimum amount of working down from a 72-in. ingot). This limits the rotor, made from a single forging, to an

output of roughly 50,000 kv-a. at 1500 r.p.m. and a proportionately decreasing kv-a. at lower speeds, assuming a solid rotor. By adopting the rotor construction involving 2 or 3-in. plates and up-set flanged shaft ends, the limiting diameter may be increased sufficiently for the largest 1500 and 1200-r.p.m. outputs, shown by Fig. 4. The design of 1200 and 900-r.p.m. generators for maximum output will be governed by questions of forging and shipping facilities, rather than by more strictly design matters.

Fig. 4 shows in curve form limiting generator capacities at various speeds. At 1500 r.p.m. and higher, the capacity is determined by the rotor and is inversely proportional to the revolutions per minute squared. At lower speeds, the capacity is limited by the stator and falls somewhat below the corresponding rotor limiting capacity as indicated by the dotted extension of the rotor curve. This curve is actually based on constant core length, when, as a matter of fact, the length can, with reason, be increased as the diameter is increased. The curve ratings, however, represent maximum lengths of core so far employed and material extensions in core length involve questions of linear expansion that must be very carefully considered. This limiting capacity curve represents capacities that can be obtained with existing commercial materials and without radical changes in stresses

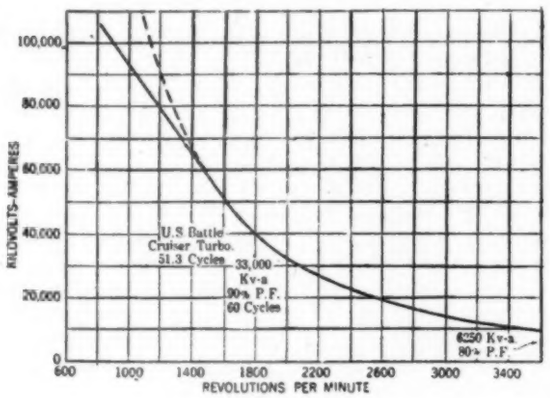


Fig. 4.

and bearing proportions. The curve does not represent limits that may not be exceeded in the future. It is, more properly, an indication of present boundaries—boundaries that will be extended as our knowledge and experience are increased. Its represents also the present judgment of designers, a judgment influenced greatly by the economic and operating advantages of still larger ratings.

The capacities shown by the curve are somewhat in advance of accomplished results. Ratings of several turbogenerators that are the largest that have been placed in operation or are under construction by the Westinghouse Electric & Manufacturing Co. have been added to Fig. 4 with self-explanatory comment.

As previously explained, the limiting capacities given for speeds below 1500 r.p.m. can only be attained by exceeding present transportation facilities if present design types are adhered to.

Incidentally it is interesting to note the advantage in limits gained by the use of 50 cycles as compared with 60 cycles. An increase of nearly 50% in rating is made possible by the 20% decrease in two-pole and four-pole speeds. This is of interest mainly when European and American maximum ratings are being compared.

The bare mention of ratings larger than 50,000 kv-a. raises the question of limits to size of individual generating units imposed by operating considerations, such as the relation between unit and station rating, the extent of the damage in case of winding failures, ability to withstand sudden short circuits, and so on.

While the detailed discussion of these questions is beyond the scope of the present paper, some design information affecting operating questions may be of interest. There is no reason for considering the larger low-speed generators less reliable than the high-speed generators indicated by limiting curve of Fig. 4. As a matter of fact, the lower speed ratings can usually be designed, both in stresses and in electrical factors, with more margin.

Mechanical forces developed by short circuits are determined by the short-circuit ampere-turns of the armature winding per inch of armature circumference, and, to a limited extent, by the density of the magnetic field set up by the rotor winding. Both the distribution of ampere-turns and the density of the air gap magnetic field are substantially constant for all limiting ratings of a given frequency. While the forces developed in a 25-cycle generator will be greater than in a 60-cycle generator—due mainly to lower reactance and the resulting greater values of ampere-turns—all 60-cycle ratings indicated by the limiting curve will have substantially equal forces developed on sudden short circuit. The stresses in the coil ends will be determined by these forces and by those factors determining the rigidity of the winding. Except possibly in the maximum size 1500-r.p.m., 25-cycle generator, with its long coil-end extension, there need be no material difference in the rigidity of the winding. Thus a 50,000-kv-a., 25-cycle, 1500-r.p.m. generator represents the most difficult design from the standpoint of short-circuit stresses. However, such a generator would not differ materially in short-circuit stress conditions from 30,000-kv-a., two-pole generators that have been in successful operation for three years. It can be stated with confidence that the danger of winding failure due to sudden short circuit, with generators of the indicated limiting outputs, will be no greater than 20,000 and 30,000-kv-a. generators that have been placed in operation in large numbers during the past six years.

Another question of interest to those responsible for the operation of large generating units is the extent of damage to winding in case of internal short circuits caused by failure of insulation between turns of the same coil or failure of insulation from copper to ground. Experience with large units now in operation has shown that, in the event of a winding failure that results in the flow of abnormal power current, the chances are that the entire winding will be destroyed and that a hole of considerable size may be burned in the core laminations. Generating units are already of such size that a winding failure usually results in the loss of output from the unit for several months. The results of failures in still larger generators will be of the same degree and will be no more serious except, of course, in that loss in kv-a. output will be greater. In this connection, it is pertinent to point out that the fusing of metal and other local effects of an internal generator failure is a function of station capacity rather than of individual unit capacity. The volume of metal fused at the point of failure is determined largely by the impedance of the generating circuits feeding into the vault. Therefore, the only difference between a failure in one of two 30,000-kva. units and a failure in a single 60,000-kv-a.

unit is in the impedance of the leads buses and other connecting circuits between the two 30,000-kv-a. units. The two 30,000-kv-a. unit installation has the obvious advantages that protective reactance may be installed between the units and the trouble is usually confined to half the station capacity.

The author has not intended to express an opinion as to the wisdom of installing very large single-shaft units. The only purpose has been to point out from the design standpoint the feasibility of certain ratings. Whether it is desirable or even wise to install very large units—above 50,000 kv-a.—will depend very largely on the growth and size of generating stations. When stations double in size—when stations of 300,000 kv-a. and 500,000 kv-a. become typical of American practice—there will undoubtedly be a demand of considerable volume for units of 50,000 kw., 75,000 kw. and 100,000 kw., and if single-shaft units are justified from the turbine standpoint, there is no question but that such generators can be conservatively designed and constructed.

REPORT ON HYDROELECTRIC POWER IN INDIA.

Government Investigation on the Available Water Power Resources and the Cost of Their Development.

The preliminary report of the systematic investigation by government engineers of the water power resources of India has recently been issued and is outlined in the British Government publication (*Board of Trade Journal*). While the data collected are admittedly incomplete, the facts gathered give a striking impression of the enormous potentialities of the development of hydroelectric power and the great benefits which the country must derive by a systematic exploitation of this national asset.

The report gives the following figures of known and probable sites where there is a reasonable prospect of obtaining power, and further states that a round estimate of 1,774,000 electrical horsepower in sight is vastly below the actual power which the final results of the survey will show:

Name of Province.	Continuous electrical horsepower.
Assam	51,200
Bengal	203,600
Bihar and Orissa	12,800
Bombay	258,300
Burma	439,000
Central Provinces	153,000
Cochin	25,000
Kashmir	30,000
Madras	106,000
Northwest Frontier Province	20,000
Punjab	260,900
United Provinces and Benares	32,200
Total	1,592,000

It is estimated that the capital cost of developing the water power of Burma and of the Punjab would be not less than $97,000,000 and $48,500,000, respectively. Of these sums there should be available for the hydroelectric departments $480,000 and $240,000, respectively, which, it is thought, should be sufficient to maintain staffs for the work.

Under the heading "Permissible Cost of Hydroelectric Development" the report deals very fully with and justifies the variations in capital expenditure necessary for different localities and under different conditions. The immediate detailed investigation of works estimated to produce up to 1,000,000 electrical horsepower is recommended and, assuming that only half of this to be ready for immediate development, an expenditure of about $162,000,000 would be necessitated. Prominent engineering authorities, however, are urging for more comprehensive and thorough investigation than the government seems willing to entertain.

The question of the control of water rights and the financing of works is also gone into, and extracts are quoted from the reports of both the British Water Power Committee and the Water Power Resources Committee of the Board of Trade. Both these authorities favor state control, to protect and serve public interests in the development of water power. At the same time, direct government control of a power scheme, once established, beyond that required for the purpose of finance, is generally deprecated.

AMBITIOUS POWER SCHEME PLANNED BY BRITISH MUNICIPALITIES.

Area of 2000 Square Miles to Be Covered at Cost Exceeding $60,000,000 on Proposed Linking Up of British Municipalities.

Plans are being prepared for the erection of a new generating station on the banks of the River Trent, to supply an area of 2000 square miles, 50 miles from north to south, and 40 miles from east to west. The area includes parts of Nottinghamshire, Derbyshire, Staffs, and Leicestershire. The first section of the station would cost £5,260,000, but supply authorities from Chesterfield to Leicester, on the one hand, and Burton-on-Trent to Newark on the other, would co-operate and bear a proportion of the cost.

It is estimated that the whole scheme will require about £14,000,000 to carry through, but it means much cheaper power, and would result in a saving of £40,000 per annum to the Nottingham Tramways alone. At the station, which would occupy at least 100 acres of land, many advantages are offered—an ample supply of condensing water, facilities for bringing coal by water and rail, for the disposal of ashes and coal storage, and, what was very important in future, a carbonization plant. The capacity of the station would be 200,000 kw., and it would require 580,000 tons of coal per annum (or 1500 tons daily) and 14,000,000 gallons of river water per hour.

The scheme outlined above is at present under consideration by the engineers and representatives of the various authorities concerned, but progress cannot be made until the Electricity Supply Bill becomes law, when no doubt the schemes will be submitted to the Government Department concerned and to the authorities which will be set up for dealing with electricity supply generally.

ELECTRICAL DEVELOPMENT IN FINNISH DISTRICT.

A stock company has been organized in the communities of Middle Osterbotten, Finland, for the development of the water power of Korpela Falls on the Lestijoki river. The cost of the development is estimated as follows: Dam and water division, 1,160,000 Finnish marks; power station, 380,000 marks; machinery, 650,000 marks; total, 2,190,000 marks (about $423,000 at the normal rate of 5.18 marks to the dollar; at the current rate, about $110,000).

Editorial Comment

The Burning Question of the Hour

WITH the strike of bituminous coal miners now in its twenty-sixth day, the coal situation assumes a vastly more serious aspect than it has assumed heretofore. The fact remains that the strike could have been settled by compromise the first day, just as well as on the twenty-seventh or the thirtieth day or whenever it is that the production of bituminous coal upon a national scale commences again. Meanwhile the visible supplies of coal on hand are diminishing and hardship and suffering and curtailment of industry come nearer.

A number of industrial plants have shut down completely and many more have curtailed production because of inability to obtain coal to keep going or because of limitations imposed by transportation or other factors arising directly out of the coal quandary. Public utilities, steam and electric railroads, especially, have curtailed their service by taking off trains and reducing schedules. Elimination of needless consumption of electrical energy as for sign lighting and advertising purposes has been made mandatory in some cities and in others the customers have been asked to voluntarily refrain from consuming needless light and power.

The strike of the bituminous coal miners will eventually be settled by a compromise. The pity is that that compromise could not have been made before, before such loss of coal production had occurred, before a strike was called at all. The reason why a compromise has not yet been made we cannot tell, a reason known only to those closest in touch with the stalemate—the coal operators and the miners' union managers. We want the strike settled, but we want it settled justly, which means not merely raising the price of coal and passing on that price increase to the ultimate consumer, but finding a solution at once equitable and sound.

The miners worked an average of 30 hours a week last year, a condition better than previous years, but a condition that needs remedying. The remedy appears to be to create a more steady demand for coal the year round instead of a seasonal demand as exists now; and ability to transport the coal when the demand for it occurs. If a demand can be created the question of railroad cars available at the mine to pick up coal mined as it is mined will tend to be answered, for the car situation is one that very largely determines how many hours the miners are able to work. It might be pointed out here that the domestic consumer is such a comparatively small consumer that his failure to purchase coal during the summer in readiness for the approaching winter is hardly a factor in giving the miners steady work. It is the public utilities, the industrial plants and the other large users of coal that must be made to distribute their purchase of coal throughout the year, and preferably during the summer months.

It is the coal pile that has saved the country from capitulation to the demands of the miners and saved the country from the mercy of the coal operators. It is the coal pile—the coal in storage—that has saved the day for the American public and American industries. "Store your coal now" is the advice that has been given the coal consumer during the summer and early fall in these columns, not once but repeatedly. That advice was sound and circumstances are now bringing home the wisdom of that advice in a vivid manner. But that advice to store coal during the months when it is not needed in readiness for when it will be needed holds for every year. To do so tends to give the miners steady work the year round—their due; it tends to lessen railroad congestion and difficulties that always come with the cold weather; it tends to create a more favorable price for the coal, since price tends to vary with demand; and favors the delivery of a better grade of coal.

The purchaser that buys his coal at the time when the mines are comparatively slack, when the nation-wide demand for coal is below the normal, is likely to obtain a better price for his coal, likewise a better grade of coal. He is helping the country's railroads, helping the miners find steady work and helping the country as a whole. Those that bought their coal and stored it see now the wisdom of their act. The thing we wish to emphasize is the desirability of keeping up the practice year by year.

Relations Between Jobbers and Contractor-Dealers

ONE of the significant features of the convention of the Electrical Supply Jobbers Association held last week in Cleveland was the changed aspect from which the jobber viewed the contractor-dealer. Everyone seemed to agree that it was desirable to keep the merchandising of electrical products within the industry and likewise it seemed to be recognized that the most satisfactory way of doing this was to utilize existing channels of distribution, namely electrical contractor-dealers. This was not simply the view of one or two jobbers, but represented the consensus of opinion among all who attended and certainly was borne out by experiences recounted at a meeting of the Atlantic Division on Tuesday.

What this change of attitude implies can only be appreciated by those who are familiar with the senti-

ments expressed by many jobbers when the Goodwin plan was first launched. It was true that the contractor of old was a poor business man with anything but a bright outlook. But Mr. Goodwin in advocating his platform of co-operation held no brief for the contractor-dealer. He simply said that if we in the industry were to put our house in order we must begin somewhere and the contractor was the logical starting point, for obvious reasons.

The start was made—an organization was perfected and the contractor-dealer was "sold" on his own future. The work has just started, however. No one realizes this better than the contractor-dealer himself. But to carry on involves the co-operation of all branches of the industry, particularly of the jobbers. And at the Cleveland convention many jobbers publicly announced that they had co-operated and found that it paid and paid handsomely.

This sentiment in favor of greater recognition of the contractor-dealer, which was crystallized at the convention, should permeate the entire jobbing industry. What the contractor-dealer needs is a sympathetic understanding of his problems and his response will be rapid and complete. When all is said and done, all that the contractor-dealer asks is a fair opportunity to take his place as an economic factor in the distribution of things electrical to the great American public.

Coal Mining With Central-Station Service

CENTRAL-STATION service instead of power produced by isolated plant has so many advantages over the latter uneconomical and often unreliable source of power that coal mines have steadily been going over to the transmission lines of the public service company. There is every reason to believe that this movement will go on at an even more rapid rate in the near future, following the reaching of a compromise in the strike of the bituminous coal miners.

It appears almost certain that the miners will obtain a definite promise for a radical wage increase. It seems not unlikely that they will also be given what amounts virtually to a guarantee that they shall have opportunity to work more steadily, a condition that will be brought about through a more steady demand for coal and a greater availability of railroad cars. Again, there is every reason to believe that the eight-hour day will remain, the six-hour day being taboo in every quarter. The effective working day may, however, be reduced in that the working day will commence and terminate from the time the men reach the mine above ground instead of from the time they commence work below ground. These things mean a higher labor cost per ton of coal and a somewhat shorter working day, therefore curtailed production.

The country needs coal. Other countries are looking to our coal resources to an increasing extent. Therefore coal production must be maintained, and the most direct and perhaps only way of accomplishing this is to resort more to mechanical methods of mining, which means electrification entirely or in part. Central-station service will thus be called upon to reduce the cost of mining and to increase the rate of coal production, to counteract the higher wages on the one hand and the shorter effective working day on the other. Mines now producing their own power will find added incentives to go over to central-station service, while those already having done so will in all probability find it desirable to increase their connected load and thereby their demand, a condition that must obtain in any case in the endeavor to maintain coal output in face of a shorter working day. The fact that coal will increase in price will make it more and more advantageous for the isolated plant to shut down and take to central-station service, for after all, the fuel used has a market value, so that even the coal operators cannot afford to waste coal that could be sold otherwise.

Central stations that are already supplying coal fields expect that when the bituminous coal miners go back to work that the mines will make a greater demand upon their lines in the way of higher peak load and increased kilowatt-hour consumption per ton of coal mined. These things will not mature immediately, there being a time lag, of course, during which additional machinery will be installed and the movement for replacing man power by electrical power gets under way. During the interim coal production may be expected to decrease. Meanwhile many mines will prepare to go over to central-station supply, because there will be little alternative to do otherwise.

Giving Electrical Christmas Gifts

RESTRICTED spending, just as much as increased production of staples and necessities, is needed now to bring about more healthy conditions, such as are needed to bring the country back to a more normal state. The fact that America is the world's creditor has brought prosperity as it has never been known before.

However, bankers, captains of industry and economists are sounding a warning to save, to spend less upon non-essentials, to call a stop to the extravagances that now seem to have become our national habit. While a prosperous industrial future lies ahead, it is also a fact that the high cost of living, existing high wages and the incessant and limitless demand for higher wages to meet higher rates of expenditure on luxuries as well as for living are a source of danger.

It is fitting that the coming Christmas should be a typical American Christmas, a fitting Christmas following a victorious war. But let it be a thrifty Christmas, a Christmas in which the electrical gift—practical, eminently useful and economical—reigns supreme.

Current Events

Jobbers Discuss Relations with Contractor-Dealers—S.E.D. Elects New President—N.E.L.A. and S.E.D. Co-operate

ELECTRICAL JOBBERS SHOW FAITH IN CONTRACTOR-DEALERS.

Discussions at Cleveland Convention Indicate Evolution in Distribution of Electrical Supplies.

Increasing tendency on the part of electrical jobbers to recognize the contractor-dealer as a legitimate outlet for electrical supplies was strikingly demonstrated in the discussion at the convention of the Electrical Supply Jobbers Association at Cleveland, O., Nov. 18, 19 and 20. Numerous prominent jobbers who have made a genuine effort to cultivate and help in the development of the contractor-dealer reported results beyond the most sanguine expectations, indicating the tremendous possibilities in this direction. At least one jobber stated that since inaugurating a policy of co-operation with the contractor-dealer the ratio of sales has been reversed as between contractor-dealer and industrial plant, sales to the former averaging 75% of the total as compared to 25% in the past.

From every aspect the Cleveland convention was one of the most successful in the history of the association. There was a large attendance of jobbers and an unusually large delegation of manufacturers and their representatives, all of whom were invited to attend the sessions.

Meetings of the Atlantic and Central Divisions were held Tuesday morning and afternoon and general sessions were held the morning and afternoon of Wednesday, with a session at 8 p. m. The Central Division gave most of its attention to the subject of compensation of employees, particularly with respect to a possible reduction in the volume of sales and of corresponding reduction in profits.

The Atlantic Division held a very interesting meeting at which the contractor-dealer situation was ably discussed. The feature of the meeting was an address by W. G. Kennedy, of the Sibley-Pitman Corp., of New York, outlining the astonishing results secured by adopting a policy of close co-operation with the contractor-dealer. Other speakers recounted similar results following the development of a contractor-dealer policy. C. W. Peet, national chairman of the National Association of Electrical Contractors and Dealers, indorsed the new policy of the jobbers and bade them be patient. He outlined briefly the work that was being done to improve conditions in the industry.

At the general sessions addresses were made by W. L. Goodwin and Samuel Chase, both speakers expressing implicit faith in the future of the contractor-dealer. A resolution was unanimously adopted pledging support of the jobbers individually to the Bureau of Research of the National Association of Electrical Contractors and Dealers.

A resolution was also adopted requesting members of the jobbers association who conduct allied businesses to divorce these from the strictly jobbing end under a separately incorporated company.

The executive sessions were held on Thursday morning and Thursday afternoon. Resolutions regarding methods of billing goods for future delivery were discussed, and the report of the lamp committee taken up in detail with representatives of the lamp manufacturers. Various changes in methods of compensation were explained, and the report of the lamp committee of the Electrical Supply Jobbers Association adopted.

The action of the Hot Springs meeting in voting to hold the next convention at Del Monte, Cal., was re-affirmed, and Franklin Overbagh, general secretary of the Electrical Supply Jobbers Association, was unanimously elected chairman of transportation.

Ross G. Holabird explained the preparations which were being made to entertain the convention in California, and aroused great enthusiasm, the members present voting practically unanimously to attend.

At the afternoon session the report of the publicity committee was received, and the session was closed with an address by J. M. Wakeman, of the Society for Electrical Development, who explained the function of the society and the very considerable growth which had come about in its work and influence.

W. W. FREEMAN PRESIDENT OF SOCIETY FOR ELECTRICAL DEVELOPMENT.

Other Prominent Men Make Up New List of Officers—Brief Report of Society's Activities and Plans.

At a meeting of the Board of Directors of the Society for Electrical Development held at the society's offices, in the Engineering Societies building, New York City, on Nov. 11, W. W. Freeman was unanimously elected president of the organization succeeding Henry L. Doherty, who has held that office since the founding of the society nearly six years ago.

As president of the Union Gas & Electric Co. of Cincinnati, Mr. Freeman is well known to all branches of the electrical industry. Being vice-chairman of the Public Policy Committee of the National Electric Light Association, of which committee Mr. Freeman was chairman for a number of years, the new president brings to the society a broad experience in dealing with matters pertaining to the relations between the great electricity consuming public and the people who produce and market the energy and the devices through which it is used.

Under his leadership the society will continue its excellent work of co-ordinating and assisting all branches of the electrical industry to bigger and better business as well as carrying to the public the message "Do It Electrically."

Under the guidance of Mr. Doherty, its past president, the society has done a big work in getting the various branches of the electrical industry together

and advancing their united interests. The extent of this work is made evident by a few extracts from the annual report of the society's general manager, James M. Wakeman.

This report emphasizes the fact that in spite of the handicap of the war, the society was able to continue its regular work of supplying articles on electrical subjects to newspapers, trade journals and popular magazines. A great deal of extremely valuable publicity for the electrical industry was thus obtained. Particular attention has been paid to developing the demand for household appliances and motors for industrial purposes. The society has under way a campaign for better industrial illumination.

When one realizes the effort that was previously required to sell washing machines, electrical ranges, vacuum cleaners or even irons, it is possible to appreciate in some measure the tremendous effect of the educational work the society has carried on during the past six years. The industry is reaping the benefit today, but as the effect is accumulative, still greater business is assured for the future.

The electrical range handbook prepared by the society has been pronounced by range manufacturers, dealers and salesmen the greatest help ever supplied to them in their work of selling the "idea of cooking electrically."

The *Monthly Sales Service* has been regularly issued and its general character not only maintained but greatly improved. The electrical men in all sections of the country are continually expressing their appreciation of the great help this publication is in carrying on their business.

Now that members have become familiar with the character of special services which they can receive from the society, requests for this sort of help are coming in daily. These requests range all the way from information wanted on voltages of lighting circuits in foreign cities, heating and cooking rates in American cities, numerous uses of electricity in the various industries, down to the names and addresses of manufacturers of this or that electrical device or the preparation of advertising copy and the outlining of a special sales campaign.

The staff of the society has always co-operated with other electrical organizations in every way possible. While there have been at times apparent duplications of the work of the society, it is believed that with a better understanding of the work of this organization there will be a better spirit of co-operation.

It is not only interesting, but extremely significant how the society has attracted the attention of other countries. Great Britain has started an "Electrical Development Association" patterned upon the Society for Electrical Development. This new organization has studied the literature, the aims and achievements of the American society and has decided to carry on the same kind of work to develop the industry in Great Britain. A member of that association has visited the society's offices and spent several days going over its files carefully.

Other visitors have come from Switzerland, from France and from Japan, all with the object of studying the methods of the society and with a view of inaugurating similar organizations in their own countries.

The society is now conducting another of its national campaigns. Through the drive for "An Electrical Christmas" the public is learning of the appropriateness of electrical devices as Christmas gifts. Reports from members and nonmembers alike indicate that the society is again doing the right thing at the right time.

In addition to the election of Mr. Freeman as president, two new vice-presidents were also unanimously elected. Fred Bissell, of the F. Bissell Co., of Toledo, is widely known as a progressive member of the electrical jobbers' fraternity. James R. Strong, of the Tucker Electrical Construction Co., of New York, stands high in the estimation of electrical contractors and dealers.

Charles L. Edgar, president of the Edison Electric Illuminating Co., of Boston, was appointed a director representing central-station interests in place of E. N. Sanderson, resigned.

Arthur J. Binz, of Houston, Texas, newly elected Jupiter of the Jovian Order, was appointed to the board in place of L. O. Ripley.

J. E. Montague was elected chairman of the new Executive Committee. The other members being: W. W. Freeman, L. P. Sawyer, W. D. Steele, E. W. Rockafellow, J. R. Strong, Fred B. Adam and J. Robert Crouse.

N. E. L. A. AND S. E. D. TO CO-OPERATE IN PUBLICITY WORK.

Meeting of Advertising and Publicity Service Bureau, N. E. L. A., Favors Eliminating Duplication of Work.

At a meeting of the Advertising and Publicity Service Bureau of the Commercial Section, National Electric Light Association, held recently in Chicago, important steps were taken to secure co-operation in electrical publicity work. In calling the meeting to order Chairman Gibbs stated that the Society for Electrical Development recently received the support of many large central-station and manufacturing organizations and that plans were being formulated to greatly expand its activities. It was desirable to so conduct the activities of both the society and the Commercial Section as to avoid duplication of effort. According to Mr. Gibbs, the Advertising and Publicity Service Bureau would function executively instead of handling in a production or mechanical way the work involved—that is, the Bureau's activities would be largely of an advisory and suggestive character. Mr. Gibbs outlined the organization of the Bureau, with particular reference to its relations with geographic sections of the association and with other bureaus and committees of the Commercial Section; also relations with other associations and various branches of the electrical industry, as indicated in the Bureau's organization chart.

No report was presented by the Division on Co-ordinate Advertising and Sales Campaigns, but in the discussion which ensued it was the consensus of opinion that this subject, originated by the Co-ordinate Advertising and Sales Campaigns Committee, now embraced in the Advertising and Publicity Service Bureau, was worthy of continuation and that a special effort should be made to obtain the co-operation of all related elements, particularly the manufacturers and central stations.

P. B. Zimmerman, chairman of the Division on Illuminating Engineering (nontechnical applications), stated that the work of this division would be largely that of effecting close co-operation with the Illuminating Engineering Society, Society for Electrical Development and the Lighting Sales Bureau, Commercial

Section, N. E. L. A., to the end that the electrical industry in general, as well as the public, would be informed regarding progress in the lighting art, as well as making understandable the technical phases of the work which were susceptible to commonplace translations.

Mr. Gibbs outlined the purpose of the Adequate Outlets Division, which was amplified by Chairman John G. Learned of the Commercial Section, the "father" of the general idea, which was to promote in every possible manner the installation of more electrical outlets, thus making it possible to use more extensively electrical appliances, portable lamps, etc.

For the Motion Picture Films Division Mr. Gibbs stated that Chairman Chas. H. Pierson, being located in Los Angeles, close to the center of motion-picture production activities, would be in a position to have consideration given to electrical applications in many films that could employ successfully material of such character.

In the absence of the chairman of the National Commodity Advertisers Division, Mr. Gibbs outlined the work of this division, which in general was to get in touch with advertisers, advertising agencies and others in an effort to have electrical appliances and their applications featured in advertising "copy" generally. It was the consensus of opinion that there was opportunity to do much educational work in this line which would react favorably on the electrical industry.

Mathias Turner, chairman of the Newspaper Advertising Compaign Division, referred to the general development of co-operative electrical pages, with particular reference to what had been accomplished in Cleveland. Frank H. Gale reviewed the general subject of advertising and publicity, dwelling on the rapidly increasing interest in electrical subjects and indicating that the time was now right to get before the public the electrical industry's message, especially as magazines and newspapers are carrying a considerable amount of electrical advertising and publishers are keenly alive to the future of the electrical industry, thus offering a big opportunity to travel on this wave of interest. J. M. Wakeman stated that 172 newspapers used regularly material furnished by the Society for Electrical Development. He reviewed the work of the society. Mr. Gibbs referred to possible co-operation of value with the American Newspaper Publishers Association.

Frank B. Rae, Jr., chairman of the News Syndicates and Magazine Writers' Division, emphasized the importance of central stations and others offering to the members stories of live interest written in an entertaining and informative manner necessary to justify and assure publication. Frank Kivel suggested development of "questions and answers" pages in magazines and newspapers, through which electrical information could be disseminated. Mr. Wakeman stated that the Society of Electrical Development was conducting work of a similar character at this time.

Cyril Nast, chairman of the Publications Division, advised that no program of activities had been outlined as he was awaiting specific instructions from Chairman Gibbs as to the scope of activities of this division.

O. H. Simonds urged that special consideration be given to co-operation with small central stations, indicating that one-half and full-page co-operative electrical advertising pages had been run successfully in Dubuque, Iowa, in close co-operation with electrical contractors and dealers.

R. S. Hale, chairman of the Wiring Committee, reviewed briefly the work of this committee, with special reference to standardization activities, all of which were calculated to help the public to use electric service conveniently and economically.

Clarence L. Law, chairman of the Lighting Sales Bureau, indicated his desire to co-operate with the Advertising and Publicity Service Bureau in every way possible.

John W. Meyer spoke of the work of the Power Sales Bureau and the opportunity afforded by the Advertising and Publicity Service Bureau for acquainting the electrical industry and the public of the advantages of central-station power applications.

Chairman John G. Learned of the Commercial Section referred to the desire of this section to co-operate closely with the Society for Electrical Development to the end that maximum results could be obtained with minimum duplication of effort and expense. He indicated that the prime object was to see that essential work was accomplished. Mr. Learned referred to the meeting of a special committee to consider co-operation between the two organizations and presented informally the following resolution, which was later to be presented before the Commercial Section's Executive Committee to form a part of the special committee's report on this subject to the National Executive Committee. The resolution follows:

> "Whereas, it is desirable that the activities of the Commercial Section of the National Electric Light Association and the Society for Electrical Development, Inc., be conducted to obtain maximum results and to avoid duplication of effort, and
>
> "Whereas, the Society for Electrical Development, Inc., has a trained and experienced staff with facilities for the general promotion of the use of electricity, electrical merchandise and other translating devices;
>
> "Be It Resolved That, A conference be held each month, or more often, if necessary, at the headquarters of the Society for Electrical Development, Inc., or the National Electric Light Association, to be composed of representatives of the National Electric Light Association and the Society for Electrical Development, Inc., as follows:
>
> "For the National Electric Light Association—Chairman (or authorized representative) of each National Special Section; chairman (or authorized representative) of each National Special Committee, and such other members of the respective Sections and Special Committees as desired;
>
> "For the Society for Electrical Development, Inc.—Such members of the Executive Committee (representing contractors, jobbers, manufacturers and central stations) as desire to attend; the general manager and such members of his staff as desired;
>
> "The conference to decide upon plans for producing, and publishing newspaper articles, publications, special campaigns and all related matters for the promotion of the use of electricity.

"The Society for Electrical Development, Inc., shall produce and distribute publications and related matter as authorized by the conference, with or without the imprint of either or both the National Electric Light Association and the Society for Electrical Development, Inc., as desired.

"For the purpose of assimilation, chairmen of the sections shall transmit to the conference information pertaining to the general activities of their respective sections.

"The sections shall issue publications as they are deemed advisable. Such publications, however, shall not be duplications of the printed matter heretofore referred to and they may be produced and distributed by the Society for Electrical Development under the direction of the section interested. Publications so produced and distributed shall be charged to the section interested at the invoice cost plus cost of distribution."

After extended discussion the resolution was unanimously adopted.

BYLLESBY UTILITIES TO BUILD THREE NEW POWER STATIONS.

Three Central Stations to Install 33,500 Hp. in New Power Plants in 1920—Additions Will Bring New Work to 100,000 Hp.

Rapidly increasing business in territories served by Byllesby electric properties has made imperative additional generating capacity. Three new power stations with a total initial capacity of 33,500 hp. have been planned for immediate construction and further necessary additions and extensions are receiving attention.

One of the new stations will be located in southern Minnesota, where demands of the southwestern districts served by the Northern States Power Co. have exceeded the capacities of the several divisions concerned. A new steam station will be constructed at this point and one 13,500-hp. steam turbine will be installed. Provision will be made for a second unit of 20,000 hp. to be installed later. Condensing water will be obtained from the Minnesota river and present equipment will include three 1165-hp. boilers with coal and ash-handling machinery, etc. The improvement is expected to be completed within a year.

A new station with an initial capacity of 10,000 hp. will be constructed in western Oklahoma to take care of the growing demands upon the Muskogee, Sapulpa and Drumright divisions of the Oklahoma Gas & Electric Co. Condensing water will be obtained from the Arkansas river.

The third station will be constructed at Pueblo, Colo., on the present power-house site of the Arkansas Valley Railway, Light & Power Co. The present power station with a capacity of 7500 hp. will be maintained and the new station with an initial capacity of 10,000 hp. will be constructed adjacent to it. This improvement, like the others, is necessary because of increasing business in the present territory and not because of expansion of territory.

With the new 40,000-hp. unit at Riverside station at Minneapolis (now under construction) and other enlargements or extensions at the properties either being built or contemplated, the combined properties of H. M. Byllesby & Co. will have available an additional 100,000 hp. of generating capacity before the end of 1920.

COLONEL ARNOLD NARRATES AIRCRAFT EXPERIENCES OF THE WAR.

Intensely Interesting Address Before the Electric Club of Chicago Explains Much of the Development Work.

The far reaching importance of much of the war work done by engineers and scientists who did not get to the battlefront or even overseas was explained by Col. Bion J. Arnold, the well known consulting engineer, in an address before the Electric Club of Chicago on Nov. 25. He spoke almost entirely of such work that he came personally in contact with, first as a member of the Naval Consulting Board and later when in active service as an engineer officer of the aircraft division of the Army and Navy.

Before we entered the war the Naval Consulting Board began studying inventions dealing with solution of the submarine menace and other weapons of warfare. Later the National Research Council and Council of National Defense took this over. Several thousand inventions were analyzed and all promising ones tried out. Out of this, for instance, came the submarine detector or listening device built on a simple principle. Colonel Arnold had long been interested in aeronautics and was chosen to make a comprehensive investigation and recommendation on speeding up of all aircraft production facilities, both for the Army and Navy. Subsequently he conducted the Congressional Committee investigating this matter to the various plants engaged on the work. Although there was considerable waste in this and other branches of our feverish war preparations, it was unavoidable and no more proportionally than would have occurred under private jurisdiction. An extraordinary amount of work was accomplished on a much bigger scale than was generally understood by the public.

Colonel Arnold also spoke of an extended investigation he made of our aluminum resources which showed these were ample for our war needs and those of our Allies, if conservation in miscellaneous consumption were affected. In the last months of the war he was engaged in co-ordinating and speeding up production of a special and very ingenious aerial offensive weapon of gigantic deadliness which was practically ready when the armistice was signed. During these months he had some thrilling flying experiences.

CONTRACTS FOR SEATTLE PLANT UNIT AWARDED.

The Seattle Board of Public Works, Seattle, Wash., has awarded contracts to furnish and install the equipment for the new steam-electric unit at its Lake Union auxiliary plant, for which bids were opened recently. The bid of Chas. C. Moore & Co., of San Francisco, was accepted on six watertube boilers of 825 hp. each, superheaters and stacks, oil heaters, oil pumps, feed-water heaters and piping system; also boiler-feed pumps and service pumps, high-vacuum jet condensers, with air and water pumps having both motor and turbine drive. This bid was $415,707.

To the Allis-Chalmers Mfg. Co. was awarded the contract for furnishing the 10,000-kw. steam turbogenerator with both steam and motor-driven exciter and all accessories at $195,500.

Commercial Practice

Electricity for Oil-Well Drilling — Explaining Increasing Light Bills — Louisville Company Sells Stock to Customers

OIL-WELL DRILLING BY ELECTRICITY PROVES ECONOMICAL.

Advantages of Electricity for Drilling Includes Savings in Cost, Small Depreciation, Simplicity and Flexibility of Operation.

It is stated that when the extensions of the high-tension transmission lines now under construction in north Central Texas are completed, most of the well drilling operators will discard the steam motive equipment on their drilling rigs for electric power. Many wells in the Burkburnett field are being pumped with electric power, and it is asserted substantial savings have been effected in the cost of drilling as well as pumping.

In one well in the El Dorado (Kansas) field engineers of the Empire Gas & Fuel Co. claim a saving of $3655.20 by using electric power instead of steam power. S. B. Severson, chief of the electrical engineering department of the company, in a report says that this well was the first one drilled in that field by electricity, although hundreds of the company's wells are being pumped by electric power.

"Attempts have been made in recent years to use electric motor equipment for drilling deep wells," says Mr. Severson, "but it has been only within the last year or two that much success has been attained. A number of wells have been drilled with electric motor in various parts of the world. The question of motor has been readily solved, but the perfect control necessary to satisfy all conditions in the drilling operation has been difficult to obtain. Results obtained in the drilling of the well in the El Dorado field and a subsequent well show conclusively that a combination of motor and control apparatus has been perfected to a degree that causes even experienced drillers to say electric drilling equipment is superior to steam. Reports from operation give ample proof that the trial was satisfactory and successful."

The veteran driller, it was believed, would not take kindly to the new method, but this did not prove to be the case. In a short time both crews became so familiar with the electric apparatus that the services of an electrician hardly were needed. This was the experience of J. G. Dickinson, electrical engineer, who was stationed at the well and who made a general report, which said:

"The maintenance of the electrical drilling equipment consisted principally of attention to the contact fingers and segments in the main controller due to the fact that these parts become pitted by the arcing caused in reversing the motor and prevent the fingers from making a good contact. This condition would not require the constant attention of an electrician, but could be handled by the regular inspector on his daily visit, and in the event of more serious trouble, the trouble-man of the electrical department could be summoned.

"The driller and tool dresser became familiar enough with the electrical equipment during the test to be particularly independent of outside assistance, so that electrical drilling equipment will not require the services of an extra man. On two or three occasions fuses were replaced, but at no time was there any serious electrical trouble. The principal delays incurred during the test were caused by rig equipment.

"While the operation during the test covered a period of 60 days, the actual drilling was accomplished in 34 drilling days, and the only water required for the test was water used in the hole for mixing the drillings.

"The controllers were so arranged that they provided 80 different speed variations. The controllers were operated by steel cable lines from levers on the 'headache' post. The weight of the motor was approximately two tons.

"The ammeter was located in the derrick close to the 'headache' post, and showed the driller the amount of power he was using. During drilling operations in hard lime, where the tools got a good rebound, it required 50 to 60 amperes, or from 30 to 35 hp. For drilling in shale, where the bit muddled up, the ammeter showed about 60 to 70 amperes, or about 35 to 41 hp. In pulling the tools out and in bailing water is usually required about 100 to 125 amperes, or about 57 to 75 hp. As the motor was 75 hp. and would stand a load of 100% continuously, a 25% overload for two hours and a 100% overload for two or three minutes there was ample reserve power for any emergency that might occur. By changing the taps in the transformer bank the voltage was raised so that while drilling it would be about 440 volts. In that way the motor received the rated voltage during the operation, which was nearly continuous.

"During the test, tachometer readings were taken while drilling in order to determine the 'kick' on the line when using a motor as compared with a neighboring steam drilling outfit, but there was not enough difference to be noticed, so the 'kick' on the line may be taken as identical on the two outfits.

"A perusal of the daily report will show that this well had more to contend with than the average well. There was much more bailing than usual, and this, in turn, caused considerable rig trouble. The bull-wheel, band-wheel and the sand-reel had to be replaced. This, with other difficulties, caused many delays that otherwise would have been avoided. Water and caving increased the cost per foot drilled more than the average for electric drilling in California.

"The many advantages of electricity for drilling were realized on this well from the start. The saving in cost includes the building of one house that will suffice for both drilling and pumping without motor and control is less than the cost of boiler and engine. The cost per day for drilling by electric power is less than with steam. The water consumption is smaller. There is almost no fire risk, and it is not necessary to

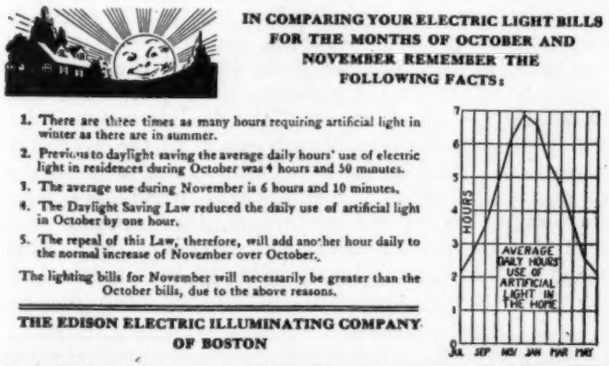
move the motor away from the rig if gas is encountered. The depreciation of the electric equipment is very small and repair parts are interchangeable. The motor used for drilling is supplied with screws at the bottom of the end shields, so that reasonable wear in the bearings may be taken up and thus the air gap may be kept balanced on all sides. With good oil for the bearings, it should not be necessary to do this more than once in eight months."

BUILDING UP THE CUSTOMER'S CONFIDENCE IN THE METER.

How Boston Edison Co. Explains Increasing Bills Due Shortening Days.

In spite of the fact that watt-hour meters have been proven uniformly accurate measuring instruments, that central-station companies have been continually decreasing their rates, and that electric service is practically indispensable to users, it is difficult to reconcile customers to the amounts of their monthly lighting bills. Central stations can generate electrical energy, but it is not so easy to generate the customer's faith in a device that measures the amount of money he has to pay for service.

The majority of complaints that come from customers are in the nature of claims for overcharges, meters "running fast" or "creeping." And just at this


IN COMPARING YOUR ELECTRIC LIGHT BILLS FOR THE MONTHS OF OCTOBER AND NOVEMBER REMEMBER THE FOLLOWING FACTS:
1. There are three times as many hours requiring artificial light in winter as there are in summer.
2. Previous to daylight saving the average daily hours' use of electric light in residences during October was 4 hours and 50 minutes.
3. The average use during November is 6 hours and 10 minutes.
4. The Daylight Saving Law reduced the daily use of artificial light in October by one hour.
5. The repeal of this Law, therefore, will add another hour daily to the normal increase of November over October.
The lighting bills for November will necessarily be greater than the October bills, due to the above reasons.
THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON
HOURS
AVERAGE DAILY HOURS USE OF ARTIFICIAL LIGHT IN THE HOME
JUL SEP NOV JAN MAR MAY

Card Sent to Customers to Explain Increase in Lighting Bill.

time of year, when lighting service demands are increasing, the complaints come the most frequent. The difference between October and November bills is the most noticeable, due to the shortening of the days and to the change back to standard time.

In order to let customers know of these conditions affecting their lighting bill, the Boston Edison Co. prepared a card, reproduction of which is given, explaining the reasons for increased bills and mailed one to each customer. The explanations are frank and convincing, and serve to build up the customers' faith in the meter and the company.

INDIANA COMPANY ASKS CO-OPERATION OF PUBLIC.

Co-operation with the public has been the object of some excellent publicity work recently done by the Northern Indiana Gas & Electric Co., Ft. Wayne, Ind. The company addressed an open letter to the public, in advertising display type, showing the public what the company is anxious and willing to do in regard to good service. The company, in the same letter, addressed an appeal to its employes for greater harmony as relating to the company's interests and the rights of the public.

LOUISVILLE COMPANY STARTS CUSTOMER-OWNERSHIP PLAN.

The customer-ownership plan of distributing electric securities among the citizens served by Byllesby companies has been extended to the Louisville Gas & Electric Co. Within a few days after the announcement of the plan in the newspapers 520 inquiries had been received and nearly 100 residents of Louisville, Ky., had become preferred shareholders.

Customers and the public generally were invited to become profit-sharing partners in the Louisville Gas & Electric Co. in accordance with the new financing policy announced by the company. To make this possible, preferred stock will be issued and offered with a view of giving people of small as well as large means an opportunity to acquire part ownership. Investment on the partial payment plan will be a feature, and the company will henceforth maintain an investment department at its office, where citizens may purchase its securities direct. The new department will be in charge of J. W. Smiley.

The company has no preferred stock outstanding at present. Recent amended articles of incorporation were filed, authorizing the issue of 7% preferred stock, and the board of directors authorized the sale of $2,000,000 of such stock to the public. Proceeds of the stock must be used for the retirement of outstanding bonds or the construction of additions and extensions to the property which would otherwise require the issue of bonds. The new stock will have full voting rights.

In the past the funds required for construction purposes to serve the increasing demands of a growing city and business have been obtained by the company through the usual investment channels. The new plan marks the inauguration of a definite step toward the building up of a large number of customer-shareholders among citizens in all walks of life. The object of the company, according to the announcement, is to make the largest possible number of home shareholders by offering them an attractive security, so that eventually the utilities will be popularly owned, and at the same time retain responsible, experienced and economical management.

DETERMINING CARBON CONTENT OF STEEL ELECTROLYTICALLY.

The carbon content of steels may be determined rapidly and quite rapidly by absorbing the carbon dioxide resulting from direct combustion of the metal in oxygen in a solution of barium hydroxide. The carbon content is decided by measuring the electrical resistance of the barium hydroxide solution. Further particulars as to the method employed and the apparatus used will be found in Technologic Paper No. 141, by J. R. Cain and L. C. Maxwell, Bureau of Standards.

CLOSE MUNICIPAL PLANT.

Voters of Eldon, Ia., have ratified a contract between the municipality and the Ottumwa Railway & Light Co. for the purchase of the community's electrical energy requirements from the company. The municipally owned steam plant, which has up to this time generated electricity for street lighting and business and residential use, will be abandoned. The company is building an extension of its transmission lines to serve the town.

Operating Practice

Sealing Up Blown-Out Concrete Dam — Carbon Dioxide and Fuel Saving—Reducing Corrosion of Turbine Blading

INTERESTING MODE OF SEALING UP BLOW-OUT IN CONCRETE DAM.

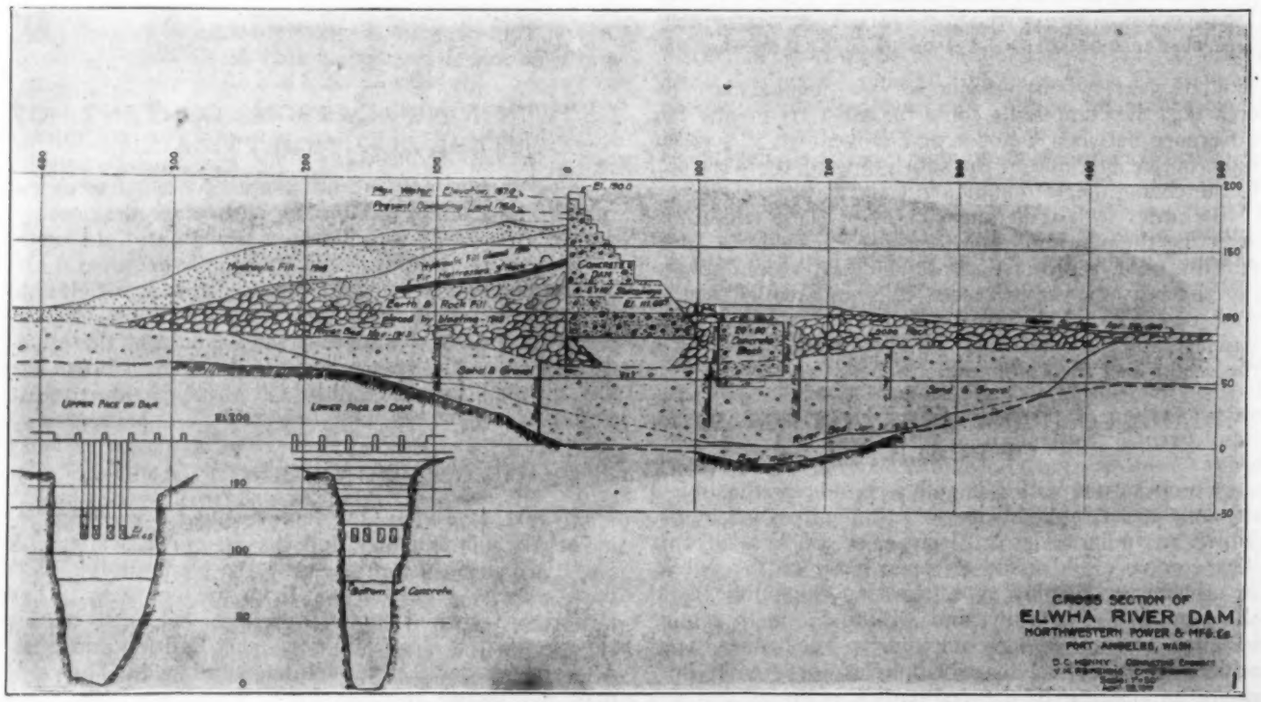
Outline of Measures Adopted to Stop Flow and Seepage Through Dam.

The blow-out which occurred under the Elwha river dam of the Northwestern Power & Manufacturing Co., in the vicinity of Port Angeles, Wash., about three years ago, created for that company the difficulty problem of building up a substructure that would make the dam available for the purpose for which it was originally built. The blow-out extended to a depth of 90 ft. below the base of the concrete dam and to a level about 10 ft. above bedrock in the canyon proper.

It was considered not practicable to unwater the stream sufficiently to allow the concrete to be extended down to bedrock, and the first step taken was to drive sheet-steel piling both above and below the dam and to run a heavy concrete block at a point just below the lower toe of the dam. Then, the canyon walls both above and below the dam were blasted in for the purpose of choking the flow of the river. This resulted in stopping about one-half of the normal flow of the stream. The next step was to fix in place a fir mattress upon the blasted-in portion of the dam and fill in on top of it 30,000 cu. yds. of material by hydraulic work. The result of this was to reduce the flow through the structure to 160 cu. ft. per sec.

At the conclusion of the work above described, the Puget Sound Bridge & Dredging Co., Seattle, was engaged to continue the hydraulic work, which has been continued and 180,000 cu. yds. of material have been filled in above the concrete dam, making about a 1 to 3 side slope. When this work was completed it was ascertained that the seepage loss had been reduced to 80 cu. ft. per sec. at the water elevation of 185.

It was decided that the hydraulic method of sealing, which had been adopted, would not in itself prove sufficient to entirely stop the seepage loss. Following this a plan was devised which it is believed will prove effectual, and the work of carrying it out is well along toward completion. First, a cofferdam was constructed of material previously sluiced in by using a drag-line scraper. The cofferdam served to cut off the portion of the basin immediately in front of and next to the concrete dam. The plan was that if, when the cofferdam was completed, a marked decrease in seepage loss was observed, a flexible copper joint would be set into the upstream face of the dam and joined to a reinforced concrete slab, 4 ft. wide and 12 ins. thick. The purpose of the flexible copper joint was to provide for possible settlement of the hydraulic fill against the face of the dam. Inasmuch as the anticipated reduction in seepage was in evidence after the completion of the cofferdam, the concrete slab with flexible copper joint was put in place. That phase of the work is being followed by a method of asphaltic sealing, to consist of joining onto the re-



Cross-Section of Elwha River Dam.

inforced concrete an asphaltic composition of such consistency as will not harden under cold water and which is to be extended over the entire area behind the cofferdam. The asphaltic sealing is to be covered with boulders and cobblestones to hold it in place. At the conclusion of this work observations will be made as to seepage loss, and if the entire method shall prove efficient, the other areas above to the dam will be treated in a similar manner.

CARBON DIOXIDE AND FUEL SAVING.

By F. A. Uehling.

I was greatly interested in reading your editorial article entitled "Air Supply to the Boiler Room" because it touches a somewhat neglected subject, yet one of prime importance to every steam power plant because it has an important influence on the amount spent for fuel. Every statement in the article is true and to the point, and still I fear it will leave the reader with the thought that too many plants suffer from an insufficiency of air for the furnace, whereas, exactly the reverse condition is true. In fact, I believe that for every boiler furnace that uses too little air there are at least a hundred that use too much.

For example, you state "Too many power plants suffer from insufficient air; too many stacks are taxed because of closed doors and windows during the cold weather. The fires in too many boiler rooms are partly asphyxiated because no proper provision for incoming air has been made. And the reason for these things is not because it has been overlooked that air is one of the three raw materials required in steam making by fuel, but because the vast volume and heavy weight involved are not fully appreciated."

By far the largest single loss in the steam power plant is found in the heat carried away up the chimney. The principal factor contributing to this loss is the excess air which enters the furnace through the ashpit door or through leaks in the boiler or furnace setting.

All air in excess of that actually required to support combustion increases the volume of gases passing up the chimney, thus supplying a greater vehicle to carry away the precious heat units. Likewise excess air mixes with the gaseous products of combustion, lowering their temperature alarmingly. It is obvious that the heat misappropriated in this way leaves fewer heat units to enter the boiler and evaporate water.

It is fortunate that there is a simple and accurate means of measuring this excess air so that it may be regulated. It is based on the fact that the percentage of carbon dioxide (CO_2) in the flue gases bears a definite relation to the percentage of excess air. The accompanying table shows how the percentage of Co_2 falls as the amount of air per pound of fuel is increased. The third column of the table shows how excess air lowers furnace temperature and the fourth column gives some idea as to the magnitude of the heat losses occuring with lower percentages of CO_2. Even slight increases in CO_2 percentages represent worth while fuel savings. For instance, an increase in CO_2 from 6.2 to 7.3% reduces the loss due to excess air from 35.7 to 30.5%. By maintaining even such a slight improvement as this the coal expense would be reduced 5.2%, not to mention other advantages.

As a matter of fact many plants are reducing their coal expense from 10 to 20% per annum by the intelligent use of CO_2 recorders. The cost of installing and operating such instruments fades into insignificance compared with the saving effected. The sixth column of the table enables the reader to estimate his actual losses up the chimney in dollars and cents. No better means could be found of driving home the fact that excess air costs money.

HEAT CARRIED AWAY UP CHIMNEY.

Based on data in "Steam Power Plant Enineering" by Prof. Geo. F. Gebhardt. Based on carbon of 14,540 B. t. u. calorific value as fuel, on dry chimney gases and 600 deg. F. chimney temperature and 60 deg. F. atmospheric temperature.

Percentages of CO_2 in flue gas.	Pounds of air per pound of fuel.	Fire temperature deg. F.	Heat wasted up chimney in B. t. u. per pound of fuel.	Percent of heat of fuel wasted up chimney.	Money wasted up chimney for every thousand dollars spent for fuel.
20	12	3,910	1,683	11.6	$116.00
16	15	3,190	2,072	14.3	143.00
13.4	18	2,700	2,460	17	170.00
11.4	21	2,340	2,846	19.5	195.00
10	24	2,060	3,240	22.4	224.00
8.9	27	1,850	3,628	25	250.00
8	30	1,680	4,016	27.8	278.00
7.3	33	1,535	4,405	30.5	305.00
6.7	36	1,415	4,798	33	330.00
6.2	39	1,315	5,180	35.7	357.00
5.8	42	1,225	5,570	39.4	394.00
5.0	48	1,085	6,350	43.7	437.00
4.0	60	880	7,910	54.4	544.00
3.0	80	680	10,500	72.2	722.00

DUQUESNE LIGHT CO. USES KEROSENE FOR REMOVING TURBINE SCALE.

It is well known that the piping of heating systems become corroded in course of time, the corrosion being due to dissolved gases taken into the system either with the feed water or through leaks in return lines at a pressure below atmospheric. One of the chief aims in reducing corrosion is to eliminate the oxygen in the water, because when this is done water ceases to be a corrosive agent in the manner here understood. Carbon dioxide causes acidity, of course, but indications are that with oxygen absent water has little tendency to cause corrosion.

Open type heaters offer one solution to reducing corrosion of pipes, oil treatment another. The Duquesne Light Co. applied the use of oil-kerosene, actually—in one case of corrosion, and with very successful results. In one of its stations, this company had a steam turbine that was corroding seriously around the blades. This turbine had to be shut down about six hours per day, because of operating conditions, during which time condensation upon the blading occurred. Oxygen entered the turbine casing through leaks and with the steam, and this in the presence of the condensate, started corrosion. This continued more or less intermittently for some two years at which time the corrosion had become a serious matter.

At the suggestion of F. N. Speller, a pure heavy mineral oil with a paraffin base was dropped into the steam ahead of the throttle at a regular rate, the purpose being to cause a thin oil film to form upon the blading and casing. This treatment proved so effectual in stopping corrosion, by protecting the surfaces, that the practice has been continued. About one and one-half gallons of kerosene are applied every day at the time of shutting down, and five gallons are applied every Saturday before the weekly shutdown. The application of kerosene in this way cleans out whatever scale exists and lessens the likelihood of any more adhering. Corrosion is, likewise, reduced.

Contractor-Dealer

Potential Field for Fan Sales—Electric Reading Lamps as Suitable Christmas Gifts—Good Example of Dealer Helps

MAKING A MARKET FOR A MILLION ELECTRIC FANS.

Opening Up a Field That Is Rife with Possibilities for the Sale of Enormous Quantities of Fans in 1921.

By D. H. Colcord.

I am no more interested in electrical dealers marketing a million electric fans in the summer of 1921 than I am in yesterday's weather report, except that as an outsider not in the business I can see merchandising possibilities to which merchants may be blind. I can see clearly and logically how dealers in and salesmen of electric fans can create a potential market for the summer of 1921 that will tax every electrical manufacturer to the capacity of their plant. Why 1921 and not 1920? There hangs the tale.

I know nearly a million places where humanity swelters without the cool breezes of an electric fan—rooms where the occupants are doing the hardest kind of mental labor—studying when they don't want to. These folks have never dreamed of a fan and once they start in there will be a riot. They will rise up and demand fans. I know, because I spent seven years in one of those rooms—in April, May, June, September and October—close to the Mason and Dixon line—trying to pound a little knowledge into their hot heads. Why isn't every school child in the United States, especially in the South, entitled to the same comfort at his work during the warm days of the spring and fall that their fathers enjoy at the office? There is the proposition: *Every school room should be equipped with electric fans.*

You have already thought of the obvious objection: that there is no school during the hot months of the year, that fans for the few hot days at the beginning and close of the term are unnecessary.

I am writing this in Pittsburgh on the last day of October with a 14-inch electric fan stirring up a room full of sultriness and warm stagnant air. I'll bet that there are a thousand fans running now within five miles of my desk; and that at the same time a squad of instructors are leaving the high school in the next block, exhausted after a "blue Monday"—blue, because it's hot and muggy and rainy, and the youngsters were "dead" all day. But their dads are not; they snapped on the fan!

I'll grant that it would be foolish to install fans in Dawson or Halifax—but not in Austin or Tampa or even St. Louis. Even if electric fans were needed only two months a year, between the Mason and Dixon line and the Canadian border, they would pay in health and happiness for the kiddies. They are not costing anything when not in use. As a matter of fact anybody knows who has "passed" geography that the two most important months in the school year are the first and the last—and these are the hottest. In September it is hard for a child to get a good start, so essential for a successful year, with the thermometer at 90 deg. June is examination time and many of us "flunked" the final exams. because it was too gol-durned-hot to think. Am I right?

Are you convinced, Mr. Dealer? If not, put the idea up to your own youngsters. Take one to your office on a hot day in June when he comes home "all tired out" from school. Tell him to sit down at your desk and get out his "problems" for tomorrow. Then slip over and snap on your fan, placing it so he will get the full benefit of the breeze. If he isn't sold, I miss my guess. He will sell you, too. I know; I tried it. He will sell your board of education eventually if you work it right.

How are you going to start the campaign? I'm not a professional agitator, nor do I believe in making young Bolsheviks out of the coming generation, but I'd say, "Start with the kids themselves."

Understand I'm not selling fans nor do I intend to, but here's the way I'd begin if I were: Double-page spread in a national magazine with four contrasting pictures—father at his desk working, enjoying the cool breeze of a Wesgen fan; opposite, a school room full of exhausted youngsters with no fan; again, same youngsters, straightened up, bright, industrious, bombarded with the breezes of a couple of fans; again, the teacher, smiling at her desk, with a little 8-in. Whizzer to the right.

Of course the electrical dealer is not interested in this phase of the publicity effort, which is up to the manufacturer, but a little pressure brought to bear on the latter would start the big idea. I don't believe I would attempt to realize on the advertising until after about two years of publicity wisely conducted, until the youngsters arise and demand that boards of education provide electric fans for the school room. Then cash in!

THE UNWRITTEN GUARANTEE ON ELECTRICAL DEVICES.

"One thing that we have found," says George J. Beattie, proprietor of the Electric Shop, Toronto, Canada, "is that it pays to sell only a quality device and at the right price, and to stand behind it. Not over a year ago, we sold a device for $500 to a customer. After four months' use it developed defects and we replaced it with a new unit. As a direct result of this stand-behind-the-goods policy direct we have since received from this customer $1500 additional business, and from a personal friend of his over $2000—a total of $3500.

"All dealers should tie up with goods made by reputable manufacturers backed up by national advertising.

"Our policy is that our interest in the sale does not end when the goods are delivered and paid for, but extends as long as may be necessary. We not only demonstrate an article but we have a trained man who goes around to each customer about once a month to see that the device is operating satisfactorily."

MERCHANDISING READING LAMPS FOR ELECTRICAL CHRISTMAS GIFTS.

How a Progressive Pittsburgh Dealer Is Disposing of Many Lamps for Students as Well as General Household Reading and Similar Uses.

As an electrical Christmas gift for the college student or the professional man or woman nothing could be more appropriate than a reading lamp, and the old adage that "goods well displayed are half sold" applies with special force to this class of merchandise. The Union Electric Co., Pittsburgh, Pa., getting into the running at an early date, sent out cards to its patrons, explaining the advantage of good

Window Display Featuring Reading Lamps.

light, and especially recommending a reading lamp as a birthday or holiday gift to students. Quotations were made on a number of different styles, and an invitation made to inspect its full line of electric lamps and secure expert advice as to the kind best adapted to their particular use.

Backing up the publicity campaign was an excellent window display, advantage being taken of the manufacturer's aids to give force to the window advertising. In the background, on a long low platform covered with green velvet, was a three-panel cutout showing men, women and children reading by electric lamps fastened in different positions. Set on mounds of velvet throughout the window were many types of study lamps with brass standards and green shades. One of them, particularly adapted to the professional man, has incorporated into its base a complete writing set—ink stand, pen rack, etc.

LIGHTING FIXTURE MANUFACTURERS TO HOLD SHOW.

The first annual lighting fixture market and chandelier show is announced to be held Feb. 9-13 in Detroit by the National Council of Lighting Fixture Manufacturers. Conventions of the Lighting Fixture Dealers' Society of America and of the Illuminating Glassware Guild will also be held at the same time.

The demand for exhibit space indicates that such an exhibition is very desirable and assures that the show will be a success. C. H. Hofrichter is secretary-treasurer of the National Council of Lighting Fixture Manufacturers and is in charge of arrangements for the show. His address is 8410 Lake avenue, Cleveland.

DEALERS' HELPS DO A GOOD SHARE OF SELLING.

Appliances are easier to sell when suggestions as to the necessity and convenience afforded by them are pointed out. For instance, a feed-through switch casually displayed in window space or show case doesn't mean much to the layman who has never used one unless a demonstration of its usefulness is made to him. It is physically impossible for the dealer to show everyone just how useful each and all of the many electrical devices are, and, realizing this, the manufacturers step in and provide sales helps that simplify the problem.

A good illustration of this is given by the line of dealers' helps prepared by the Cutler-Hammer Manufacturing Co. in connection with its "70-50" feed-through switch. The handling of these switches by dealers as accessories and as part of flatiron and toaster equipments has become so standardized that a piece of permanent advertising seemed warranted. A large lithographed metal sign was the result and to accompany this selling suggestions, folders and lantern slides were prepared to convey the message to the uninitiated of the usefulness of such a device.

A Good Example of the Many Dealers' Helps Prepared by Electrical Manufacturers.

These helps relieve the dealer of much of the educational work that are part of the sales of electrical appliances and do much to increase the total volume of sales.

ELECTRICAL SHOW TO BE HELD AT WORCESTER, MASS.

During the week from Nov. 29 to Dec. 6 an electrical show will be held at Worcester, Mass., the electrical interests of that city combining to make an exhibition to stimulate holiday sales.

On Dec. 3 the Massachusetts State Association of Electrical Contractors and Dealers will hold its annual meeting at Worcester. Officers for the coming year will be elected and other business matters will come up before the association, after which J. A. Corcoran, of General Electric Co., will give an address on "The Merchandising of Electrical Products."

New Appliances

Westinghouse Safety Inclosed Service Entrance Switch—Washing Machine with All the Mechanism Safely Inclosed

New Electric Washer Combines Safety With Economy.

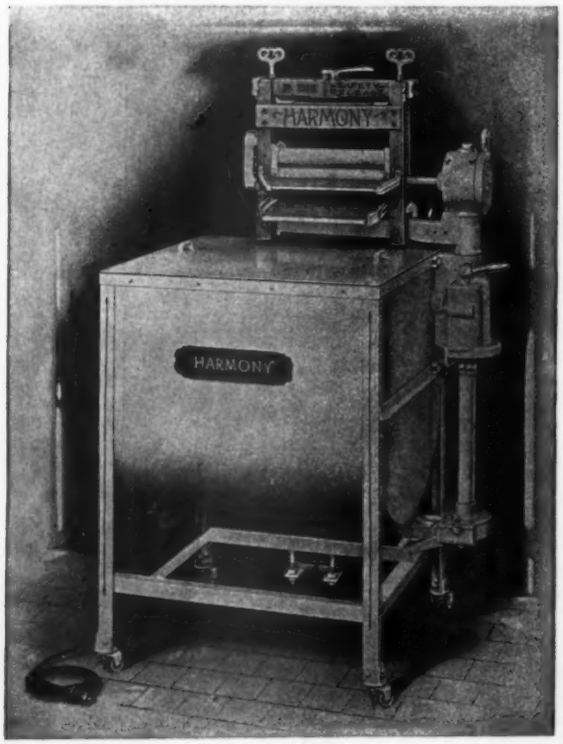
Equipped with devices which prevent accidental starting, and incorporating improvements resulting from many years of experience with washing problems, an electrically driven washing machine known as the "Harmony" and lately placed on the market by the Clark-Cadle-Harmon Corp., Rochester, N. Y., is becoming popular as a labor-saver in the home.

One of the safety devices consists of a lever which must be depressed before the machine can be started. This is especially advantageous in preventing the mischievous or accidental starting by children. Another safety device comprises a stop which prevents the wringer from being started under any conditions unless locked in position and ready for work. The wringer also has a safety release at the top to relieve the load if the clothes become clogged in the rolls. All working parts are inclosed so that there is no danger of fingers or clothes being caught in them.

The machine is driven by a ¼-hp. Westinghouse splashproof motor, which under test has proved durable and efficient.

It is noteworthy that the washing cylinder is made of selected white cork pine, a light, clear wood which absorbs little water and is easy to clean. An advantage of using wood is that it causes less wear on the clothes because of its elasticity and lack of thin sharp edges.

The frame is electrically welded into practically one piece, and is mounted on large ball-bearing, double casters which enable the machine to be easily rolled in any direction.



Electric Washer With Special Safety Features.

A New House-Entrance Safety Switch.

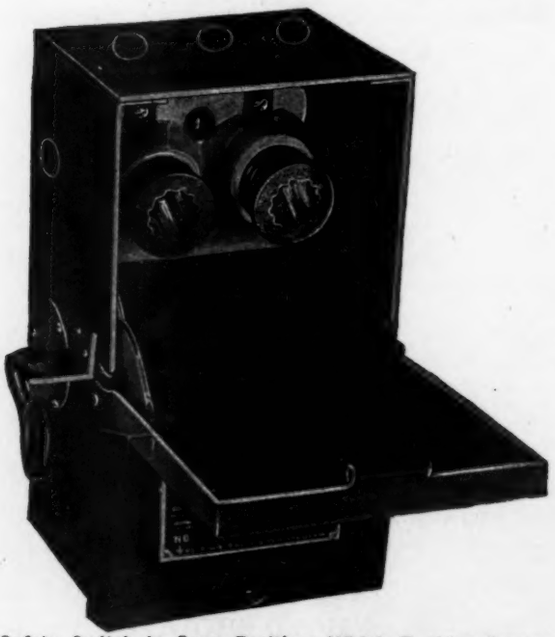
It is now becoming generally recognized that the unprotected knife switch is too dangerous to be used in places where it can be handled by careless and ignorant persons, especially in the home where it can be reached by children. The best modern wiring practice therefore demands the use of safety switches in such locations.

The new Westinghouse type WK-53 switch has been designed to meet this demand. It is perfectly safe to operate, the fuses can be renewed only when they are dead, unauthorized persons can not reach live parts, and the switch can be locked open if desired. At the same time its construction is simple and its cost very low. It is suplied in a 30-ampere, 125-volt size and is especially adapted for house-entrance service; but it can also be used to advantage in place of an open knife switch for any purpose within its capacity.

The switch, which is of knife type, is mounted together with two plug fuses on a porcelain base and is inclosed within a steel box. It is operated by a projecting handle and opens with a quick break, no matter how slowly the handle may be operated.

The cover of the box consists of two parts, hinged together. The upper part, which covers the knife switch, is held in place by screws. The lower part forms a door, which gives access to the fuses. It is, however, impossible to open this door unless the switch is in the off position when the fuses are dead; if the switch is closed when the door is open, the door closes also; and a barrier prevents access to the switch and terminals from the fuse compartment. Hence there is no possible way (short of damaging the switch) of getting a shock when renewing the fuses.

The upper part of the cover can be protected by a seal and the handle can be locked in the off position by a padlock. Unauthorized persons can therefore be prevented from getting at the live parts and also closing the switch. These features are valuable safeguards in any service, but appeal especially to central stations as they prevent theft of current.



Safety Switch in Open Position, Which Enables Access to Be Obtained to Fuse Compartment.

Lately Approved Appliances

The electrical fittings listed and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Armored Cable.—Arrow Flexible Conduit Co., Inc., 212 Canal street, New York.

Marking: Letter "A" in circle stamped in armor at intervals of about 3 in.

Listed June 2, 1919.

Cabinets and Cutout Boxes, Sheet-Metal.—United Metal Box Co., 49 Sixth avenue, New York, N. Y.

Listed Sept. 10, 1919.

Connection Block.—Benjamin Electric Manufacturing Co., 120 South Sangamon street, Chicago.

Consisting of two or more terminal plates, each with two binding screws, mounted on base of insulating material. Designed for mounting in conduit box to facilitate making connections. "Benjamin," Catalog Nos. 6912 to 15 inclusive, 6936, 6937, 6952.

Listed Aug. 21, 1919.

Cutout Bases, Plug-Fuse. — The Gordon Electric Manufacturing Co., Waterville, Conn.

"Gordon," 0-30 amperes, 125 volts. Catalog Nos. 1935, 2135.

Listed Sept. 8, 1919.

Cutout Bases, Plug-Fuse.—Ward Electric Co., 1411 Walnut street, Philadelphia, Pa.

"Ward." 0-30 amperes, 125 volts, Catalog Nos. 1935, 2135, 2165, 2199, 2965, 8042.

Listed Aug. 29, 1919.

Dental Equipment Stand.—The S. S. White Dental Manufacturing Co., 211 South 12th street, Philadelphia, Pa.

Consisting of pedestal designed to stand by dentist's chair and upon which are mounted an extensive line of electric, gas, air and water attachments, suitable for use in performing a great variety of dental operations. Catalog No. 5.

Listed July 2, 1919.

Fixtures, Vaporproof.—The Adapti Co., 919-25 West street, Cleveland, Ohio.

"Adapti." Catalog Nos. 9100, 9101, 9110-12 inclusive, 9120-22, 9130-32, 9140-42, 9150-52; 9200, 9201, 9210-12, 9220-22, 9230-32, 9240-42, 9250-52, 9500-02, 9510-12, 9520-22, 9530-32, 9540-42, 9550-52, 9600-02, 9610-12, 9620-22, 9630-32, 9640-42, 9650-52.

Listed Oct. 10, 1919.

Fuses, Cartridge.—Ward Electric Co., 1411 Walnut street, Philadelphia, Pa.

"Ward." Cartridge inclosed fuses. 0-600 amperes, 250 volts, 0-200 amperes, 600 volts.

Listed Aug. 29, 1919.

Fuses, Plug.—Whitman Electric Manufacturing Co., 352 South avenue, Whitman, Mass.

"Blue Ribbon." Edison plug fuses. 0-30 amperes, 125 volts.

Listed Sept. 6, 1919.

Ground Clamps.—Emil C. Zisterer, 4701 West 12th place, Cicero, Ill.

"Zisterer." Continuous copper strip for bonding and grounding pipes and conduits 2 in. size or less.

When distance between pipes and conduits is not so great as to require insulated connecting ground wire, continuous strip installation reduces number of joints and connections to minimum.

Listed Aug. 22, 1919.

Heating Appliances, Liquid.—Hot-Flo Faucet Corp., 1400 Broadway, New York.

Electric faucet, consisting of electric heater and switch combined with water faucet; switch spindle controls both electric current and water.

"Hot-Flo." 14 amperes, 125 volts; 7 amperes, 250 volts, a.c.

Listed Aug. 12, 1919.

Insulating Supports.—Line Material Co., South Milwaukee, Wis.

Stamped bases, or malleable-iron hooks or brackets, galvanized, to which petticoated porcelain insulators are secured.

Catalog Nos. 1818-G, 1919-G, 2001-G, 2051, 2201, 2231, 2261, 2324-G, 2332-G, 2341-G, 2352-G, 2355-G, 2411-G, 2413, 2417, 2421, 2423, 2433-G, 2473, 2681, 2951-G, 2959-G, 2961-G, 2969-G, 2973-G, 2977-G, 2989-G, 2995-G, 3205-G, 3219-CG, 3233-G, 3237-G, 3247-G, 3305-G, 3309-G, 3319-CG, 3323-G, 3333-G, 3337-G, 3347-G, 5050-G, 11529, 11538.

For low-potential conductors No. 8 B. & S. gauge or smaller, when installed in manner acceptable to inspection department having jurisdiction.

Listed July 15, 1919.

Outlet Bushings, Service-Entrance.—Cap-Swivel-Let Co., Warren, R. I.

"Johnson's." Porcelain fittings having separate openings for wires and secured in cast-iron caps attached by threaded swivel bushing to rigid conduit. ½-in. to 2-in. sizes included. Types AW, BW.F.

Listed Oct. 6, 1919.

Pump.—The Vaile-Kimes Co., 35 St. Clair street, Dayton, Ohio.

Electrically operated pump for domestic water supply automatically controlled by switches, pressure or float-operated.

"V-K." 250 volts or less, 1½ hp. or less. Fig. 120, sizes 0, 1; Fig. 130, sizes 3, 5, 7; Fig. 140, sizes 0, 1; Fig. 150, sizes 3, 5, 7; Fig. 173, size 203; Fig. 177; Fig. 178; Fig. 183; Fig. 185; Fig. 266, sizes J, K, L, M; Fig. 267, sizes E-2, E-4, F-4, F-6, F-8, G-8, G-10.

This rating is to be understood as indicating that in construction the electrical hazard has been reduced to an acceptable degree. It is not to be construed as approval of device for use in connection with automatic sprinkler or other fire-protective equipments, for which services their merits have not been investigated.

Listed Aug. 13, 1919.

Receptacle for Attachment Plugs, and Plug.—Oliver Electric & Manufacturing Co., 4221 Forest Park boulevard, St. Louis, Mo.

"Oliver." For use in series with switch and not for opening or closing circuit under load.

3-pole, 60 amperes, 550 volts. Type S.P.R.

Listed July 19, 1919.

Receptacles for Attachment Plugs, and Plugs.—Ward Electric Co., 1411 Walnut street, Philadelphia, Pa.

"Ward." 660 watts, 250 volts. Catalog Nos. 4000-01.

12 amperes, 250 volts. Catalog Nos. 4500-02 inclusive.

Listed Aug. 29, 1919.

Receptacles for Attachment Plugs.—John I. Paulding, Inc., New Bedford, Mass.

"Paulding." 660 watts, 250 volts. Catalog No. 8010.

Listed Sept. 22, 1919.

Receptacles for Attachment Plugs, and Plugs, Vaporproof.—The Adapti Co., 919-25 West street, Cleveland, Ohio.

"Adapti." Catalog Nos. 9410-12 inclusive, 9420-22, 9430-32, 9440-42, 9450-52.

Listed Oct. 10, 1919.

Receptacles, Medium-Base.—Kirkman Engineering Corp., 237 Lafayette street, New York, N. Y.

"Kirkman." Porcelain receptacles. Keyless. Catalog No. 50715.

Listed Sept. 5, 1919.

Rectifiers.—Mills Novelty Co., Jackson boulevard and Green street, Chicago.

Dynamotor type rectifiers for charging small-capacity storage batteries. A.c., 110 volts, 60 cycles. D.c., 15 volts, 18 amperes; 30 volts, 9 amperes; 45 volts, 5 amperes or 110 volts, 2 amperes.

Standard when dynamotor and its wiring up to storage battery are installed according to Class C specifi-

cations of National Electrical Code.
Listed July 28, 1919.

Rectifier. — St. Louis Electrical Works, 4060 Forest Park boulevard, St. Louis, Mo.
Vibrating rectifier for charging small storage batteries from a.-c. supply lines. 110 volts, 60 cycles, a.c.; 6 volts, 6 amperes d. c. Type MU.
Vibrating contacts in operation are capable of producing arcs which may, under certain conditions, ignite flammable vapors. Devices having such contacts should preferably be placed outside rooms likely to contain such vapors, or if in such rooms, must be installed in accordance with requirements of inspection department having jurisdiction.
Listed Aug. 8, 1919.

Rosettes, Fused, Link Type.—John I. Paulding, New Bedford, Mass.
"Paulding." For use only in large mills in accordance with Rule 23d of the National Electrical Code. 2 amperes, 125 volts. Catalog No. 14203.
Listed Sept. 22, 1919.

Sewing-Machine Motor and Control Rheostat.—Hamilton-Beach Manufacturing Co., Racine, Wis.
Portable motor for operating domestic sewing machines together with foot-operated control rheostat, and separable attachment plug, separable cord connector and portable flexible cord for attachment to supply circuit. 115 volts, d.c. or a.c.
Listed July 18, 1919.

Signal Appliance, Miscellaneous.—Charles J. Dorrance, 5247 Ravenswood avenue, Chicago, Ill.
Device on principle of induction coil designed to take current from direct-current lighting circuit at 125 or 250 volts and to supply current at approximately 10 volts to signaling circuit. Primary wiring to be in accord with Class C requirements, National Electrical Code.
"Dorrance D. C. Voltage Reducer, Type D.C.-A."
Listed Oct. 1, 1919.

Signaling Systems.—The Holtzer-Cabot Electric Co., Roxbury, Boston, Mass.
"Plug Type Relay Unit System." Hospital signal system composed of push-button calling stations on flexible cords and signal lamps at calling stations, corridors and annunciators, together with buzzers for audible signals; a.c. or d.c., 125 volts or less.
Standard when all wiring is installed in accordance with Class C rules, National Electrical Code.
Listed Aug. 5, 1919.

Signs.—A. & W. Electric Sign Co., Prospect and West Third streets, Cleveland, Ohio.
Electrically illuminated display signs for general use.
Listed Aug. 2, 1919.

Sockets, Mogul-Base.—Benjamin Electric Manufacturing Co., 120 South Sangamon street, Chicago, Ill.
"Benjamin." Porcelain shell.
Keyless, socket extension. Catalog Nos. 4396, 4397.
Listed Aug. 22, 1919.

Stand for Flatiron.—Mrs. Catherine V. Wilson, 2591 Broadway, Toledo, Ohio.
"Wilson Iron Rest." Corrugated steel stand to be secured by screws to end of ironing board, for pressing irons consuming 660 watts or less.
Listed Sept. 17, 1919.

Sockets, Medium-Base. — Henry Cole & Co., 54 Old Colony avenue, Boston, Mass.
"Cole." Weatherproof sockets. Porcelain. Catalog No. 9366.
Listed Sept. 18, 1919.

Supports for Switch Boxes.—E. & B. Manufacturing Co., 965 Woodward avenue, Detroit, Mich.
"E. & B." Formed, sheet-steel supports in single and gang types having flanged edges for mounting on studs and notches for screws securing switch boxes.
Listed Sept. 11, 1919.

Switches, Inclosed.—Square D Co., Detroit, Mich.
"Square D." Two, three or four-pole knife switches and cutout bases for standard plug or cartridge inclosed fuses. Inclosed in metal cases and designed for manual operation without opening cases.
30 amperes, 250 volts or less. Catalog Nos. 57311, 78211, 78311, 96211, 96311, 97311.
Listed July 3, 1919.

Switches, Oil-Break.—Electric Service Corp., 511 Sutter street, San Francisco, Cal.
"Adler." Two or three-pole, oil-immersed switches designed for manual operation without opening case, provided with no-voltage release coils and in sizes up to and including 30 amperes with overload release.
440 volts or less, 100 amperes or less.
Listed July 8, 1919.

Switches, Knife. — Ward Electric Co., 1411 Walnut street, Philadelphia, Pa.
"Ward." 30 amperes, 125 volts. Catalog Nos. 801, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007.
30 amperes, 250 volts. Catalog Nos. 802, 803, 2030, 2031.
Listed Aug. 29, 1919.

Switches, Miscellaneous — Oven-Door.—J. F. Hoenninger, Jr., 322-24 West King street, Lancaster, Pa.
Single-pole knife switch in cast-iron case with spring-actuated push rod arranged to engage with door of bake ovens to illuminate lamps in oven when door is open. For use on branch lighting circuits. 660 watts, 250 volts.
Listed Aug. 8, 1919.

Switches, Oil-Break.—W. E. Mushet Co., 502 Mission street, San Francisco, Calif.
"WEMCO." Three-pole, oil-immersed switches designed for manual operation without opening case, provided with no-voltage and overload release coils. 10 hp., 440 volts or less.
Listed Aug. 6, 1919.

Switches, Rotary Flush, Vaporproof.—The Adapti Co., 919-25 West street, Cleveland, Ohio.
"Adapti." Vaporproof box complete with standard labeled snap switch.
Catalog Nos. 9300-02 inclusive, 9320-22, 9340-42, 9350-52.
Listed Oct. 10, 1919.

Switches, Surface. — The Chelten Electric Co., 4859-65 Stenton avenue, Philadelphia, Pa.
"Chelten." Single-pole. Catalog No. 1200.
Listed Sept. 10, 1919.

Transformers, Bell-Ringing.—Killark Electric Manufacturing Co., 3940 Easton avenue, St. Louis, Mo.
"Killark." Air-cooled transformers designed to supply current at following voltages: For use only in ringing bells or for similar signaling work when primary wiring is installed in accordance with Class C rules, National Electrical Code.
25 or 60 cycles, primary 110 or 220 volts, secondary 10 volts or 6, 12 and 18 volts.
Listed June 20, 1919.

Wire Connectors.—The French Manufacturing Co., Grandview avenue and Robbins street, Waterbury, Conn.
Copper lugs of stamped tubing for making electrical connection to wires and cables. Each lug is marked with equilateral triangle on top of barrel. 0-30, 31-60, 61-100, 101-200-ampere ratings.
Listed June 27, 1919.

Wire Connectors.—H. B. Sherman Manufacturing Co., Battle Creek, Mich.
Solderless splicing device, consisting of brass sleeve and brass clamping screws for tightening on conductors.
For use in joining wires No. 12 B. & S. gauge or smaller, where such joints are accessible for inspection at all times.
Laboratory tests indicate this connector will not hold more than two No. 12 B. & S. gauge conductors, more than three No. 14 B. & S. gauge conductors, nor conductors of different size at same end.
Note: Joint must be insulated as required for soldered joints.
Listed June 26, 1919.

Wire—Flexible Cord.—The Whitney Blake Co., New Haven, Conn.
Marking: One uncolored cotton thread running parallel with conductor between insulation and braid.
Listed July 18, 1919.

Wire — Flexible Cord. — Flexible Woven Cable Co., 170 Purchase street, Boston, Mass.
Marking: One red, one yellow and one green thread between outer covering and rubber jacket or one red and one green thread between braid and rubber insulation on each conductor.
Listed Aug. 13, 1919.

Wire, Portable Flexible Cord for Electric Heaters.—The Whitney Blake Co., New Haven, Conn.
Marking: One uncolored cotton thread running parallel between insulation and braid.
Tag on coil to read "National Electrical Code Standard."
Listed Aug. 6, 1919.

Trade Activities

Crystal Washing Machine Co. Holds Successful Convention —Doehler Die Casting Co. to Erect New Plant—Literature

Wellman-Seaver-Morgan Co., Cleveland, has issued Bulletin No. 38, dealing with its dock cranes installed at the U. S. Army Supply Base, Boston. An extensive description of these crane installations was given in ELECTRICAL REVIEW, Nov. 8.

American Machinery Equipment Co., Detroit, Mich., was recently organized as a clearing department for cranes, boilers, power plant equipment, new and second-hand machinery, etc., with headquarters at 1246 Penobscot building. The company's operations will cover the entire east and central western sections of the country with branch offices in all the largest cities, according to W. R. Gard, general manager.

Voss Brothers Manufacturing Co., Davenport, Iowa, manufacturer of hand and power washing machines, is erecting a new factory, which will be joined to the old building with a tunnel and an overhead bridge. The new building will be a four-story structure, 150x75 ft., and of brick and concrete construction. It will be modern in every respect and will be used for assembling a new type of machine which the company is manufacturing.

Edison Electric Appliance Co., Inc., 5660 West Taylor street, Chicago, has issued a handsome bulletin, introducing its new line of "Hotpoint" 1847 Rogers Brothers silver plated ware. It contains two full page illustrations of the silver plated tea set and percolating coffee urn set and gives some idea of the remarkable beauty of this electric hollow-ware which has been added to the Hotpoint line of appliances. It is of the Adam period style, artistically designed, and lends an atmosphere of wealth wherever seen.

Doehler Die Casting Co., manufacturer of die-castings in white metal, aluminum and brass alloys, and bronze back and aluminum back babbitt-lined bearings, with main office and eastern plant at Brooklyn, N. Y., and branch plant at Toledo, Ohio, has just closed the purchase of a seven-acre tract in Chicago, on which the company will erect a modern one-story concrete steel and brick structure for the manufacture of die castings and bearings, in order to respond to the increasingly large demand for its product. Contract for the new building has already been let and operation started. The building is to be completed and ready for occupancy and operation on or about Jan. 1, 1920. This enterprising concern, one of the world's largest manufacturers in its particular line, has been influenced in this move by a policy for which it has long been noted—service to its customers.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has issued, effective Nov. 1, a new retail price list on electric ware, which includes iron, percolators, toasters, hot plates, chafing dish vessels, warming pads, luminous radiators, air heaters, etc.

Allis-Chalmers Manufacturing Co., Portland branch, has received an order from the Pelican Bay Lumber Co., Klamath Falls, Ore., for a 1000-kw. turbine. This unit will be complete with condenser, exciter and centrifugal injection pump. The machinery is for 480-volt, 60-cycle, 3-phase service, and has a capacity of 1500 amperes per terminal at full load.

American Wiremold Co., with general office and factory at Hartford, Conn., is sending out a new discount sheet (No. 5) to contractors, applying to doubling of all list prices published prior to Nov. 1. This action was taken in deference to the wishes of many thousand contractors, who are using Wiremold and have asked that the list prices of Wiremold and of Wiremold fittings be increased in order that they might have a basis for figuring wider margins of profit on this line of material which is meeting with increasing popularity.

McCarter & Cooper is the name of a new firm of consulting engineers formed by Robert D. McCarter and William L. Cooper, with offices at 165 Broadway, New York. Prior to 1902 Mr. McCarter was connected with the General Electric Co. in London as chief engineer and from that time until 1914 he maintained a consulting engineering office in London. He was also consulting engineer for all the European Westinghouse companies and president and managing director of the Russian Westinghouse Co., and in 1914 opened his office in New York. Mr. Cooper was for 15 years European manager and chief engineer for Robert W. Hunt & Co., prior to the establishment of his office in New York in 1917. The purchasing department of this firm will be located at 50 Church street.

Harvey Hubbell, Inc., Bridgeport, Conn., is sending out two new pieces of literature to the trade dealing with industrial illumination, and are a part of the extensive publicity campaign which the company is now conducting. One of these circulars illustrates and describes various types of Hubbell lamp guards, which protect lamps from breakage in shops or warehouses or wherever the lamp is exposed. Hubbell locking lamp guards are provided with lock and key and can be supplied to fit any type of socket. The other circular (No. 184) points out the essentials of efficient industrial lighting and the part that reflectors play in the distribution of light. Various types of reflectors with their respective distribution curves are illustrated, as is also a typical factory installation showing the type of reflector used and the effectiveness of this particular design. Both of these circulars, with any desired imprint and in any quantity, are offered gratis to the dealer of Hubbell electrical specialties for distribution to his customers.

Crystal Washing Machine Sales Convention.—That the electric washing machine has received the endorsement of the entire American household was borne out by the distributors and salesmen of the Crystal Washing Machine Co., who held their annual convention in Detroit, Mich., the week of Nov. 10-15. Among those who attended the convention aside from representatives from all parts of the country were Phillip R. Mallory, president of the Mallory Industries, Inc., manufacturer of household appliances, of which the Crystal company has just been made a subsidiary; Frank E. Seeley, vice-president in charge of production; C. A. Magee, vice-president in charge of sales, and F. C. Sebulske, secretary, who has been made general manager of the Crystal company and directed the convention program.

Many interesting facts were brought out at this convention, but probably the most striking was the remarkable growth of the electric washing machine industry, and the optimistic view held of the future was further evidenced by the demand of the distributors that the production figures for next year be set at 120,000 machines. These figures, Mr. Seeley said, would tax to the utmost the four large plants operated by the company throughout the country, but he lent assurance that material has already been purchased to exceed this demand. Mr. Mallory outlined the policies and activities of the company for the coming year, and laid great emphasis upon the coming year as a record breaker in the washing machine industry. Another important part of the convention was that brought out by Mr. Magee in his talk on territorial quotas, and a wider distribution of the washing machines. He pointed out that under the new distributing plans and with the co-operation of trade publication and newspaper advertising the company hoped to put the washing machine within the reach of every household, no matter how remote may be the section in which they live. To further the widespread plan of distributing the washing machine, Mr. Sebulske outlined the plan of dealer co-operation that this company plans to give every distributor and dealer.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Manchester, N. H.—Manchester Traction Light & Power Co. has completed arrangements for the issuance of notes for $1,750,000, the proceeds to be used for general business expansion.

Cambridge, Mass.—Palmer Electric Manufacturing Co. has started work on a plant, 50x200 ft.

Bridgeport, Conn.—United Illuminating Co. will erect a power house of 75,000-hp. capacity, generator house, boiler house, switchboard and screen house. The plant will be equipped with automatic stokers and ash removers.

Elmwood, Conn.—New Departure Manufacturing Co., Bristol, will erect a three and four-story reinforced concrete building. Extensive improvements in its plant at Bristol are also being considered. The work will take seven months and will involve an expenditure of several million dollars.

Bristol, Conn.—In connection with the construction of the proposed additions at the plant of the New Departure Manufacturing Co., to comprise four-story building, about 110x220 ft.; one-story structure, 100x200 ft.; two-story transformer house, 41x133 ft.; boiler plant, 45x58 ft.; machine shop, 70x263 ft.; administration building, printing plant, and auxiliary structures.

New Haven, Conn.—Seamless Rubber Co. has had plans prepared for the construction of a new power plant to be used in connection with the new plant of the company now in course of construction on Hallock avenue.

West Haven, Conn.—Kelly Tire & Rubber Co., 262 Chapel street, New Haven, is having preliminary plans prepared for the construction of a new three-story plant and one-story power house, about 75x260 ft., and 25x260 ft., respectively, to be located at West Haven. The project is estimated to cost $500,000. Westcott & Mapes, Inc., 207 Orange street, New Haven, is architect for the company.

Providence, R. I.—Robbio Electric Co., 753 Eddy street, has filed notice of organization to engage in the production of electrical goods. Benjamin Robbio, 23 Barclay street, heads this company.

Brooklyn, N. Y.—Metropolitan Engineering Co., 1250 Atlantic avenue, manufacturer of protective devices, will erect a two-story plant addition, 100x148 ft.

Churchville, N. Y.—F. S. Tracy, electrical engineer, of Middleport, was retained to make an exact estimate of the cost of the installation of an electric lighting system for the village.

Endicott City, N. Y.—In connection with the construction of the proposed plant of the International Time Recording Co., North street, now under consideration, estimated to cost $150,000, considerable electrical equipment will be required.

Middleport, N. Y.—Niagara Sprayer Co., manufacturer of spraying machines, will build a one-story machine shop, works, power plant and chemical plant.

New York, N. Y.—Alberger Pump & Condenser Co., 140 Cedar street, has been reorganized with a capital of $499,250, to manufacture pumping equipment, condensers, etc.

New York, N. Y.—Ohio Utilities Co., 115 Broadway, a Delaware incorporation, has filed notice with the Secretary of State of an increase in its capitalization from $5,000,000 to $7,750,000, for general business expansion.

New York, N. Y.—New York Edison Co., Irving place and 15th street, has completed plans for the construction of a new three-story transformer station, about 42x75 ft., to be located at 421-23 East Sixth street. The structure will be of brick construction, and is estimated to cost $60,000.

New York, N. Y.—Vitreous Enameling & Stamping Co., 11 East 147th street, is having plans prepared for a one-story, 95x172 ft., plant.

Port Chester, N. Y.—P. R. Mallory, Inc., manufacturer of tungsten products, has awarded a contract to George Mertz & Sons, Port Chester, for the construction of the proposed two-story and basement plant, about 40x112 ft., to be used for increased capacity. The structure is estimated to cost $60,000.

Rochester, N. Y.—City has awarded a contract to W. F. Martens, 244 Cutler building, for the erection of a new one-story boiler plant and laundry building on Woodman road. The structure will be about 46x167 ft., and is estimated to cost $35,000.

Pulaski, N. Y.—In the early spring ornamental lights will be planned in the business section of the city. Address Frank L. Burdick, cashier of Pacific National Bank.

Annandale, N. J.—Plans are under consideration by borough officials for the installation of a new electric street-lighting system. It is understood that electric service will be furnished by the Jersey Electric Co., High Bridge.

Bloomingdale, N. J.—Borough Council is understood to be arranging plans for the installation of a new electric street-lighting system, service to be furnished by the municipal electric plant at Butler, N. J.

Hoboken, N. J.—Button Machinery Co. has filed plans for a three-story reinforced concrete plant at 401-15 11th street, to cost about $100,000. A boiler plant and other construction work will cost $70,000.

Newark, N. J.—Roth & Co. has had plans prepared for the construction of a large new cold storage plant to be located in Plane street, near Orange street. The structure will be two-story, about 60x150 ft., and will include a heating plant, refrigerating apparatus, electrically operated elevators, etc.

Nutley, N. J.—Board of commissioners is understood to be considering plans for the installation of a new street-lighting system on Park avenue, between Washington avenue and the Passaic river bridge.

Rosenhayn, N. J.—The committee is planning to secure electric lighting. Address Samuel Vinie.

Wharton, N. J.—New Jersey Power & Light Co. is arranging for the installation of new electrically operated pumping equipment on the Rockaway river to have a capacity of 500,000 gal. per day, to be used by the Borough of Wharton.

Whitehouse, N. J.—Readington township committee is considering plans for the installation of a new street-lighting system in the Whitehouse and East Whitehouse districts.

Wrightstown, N. J.—Hanover Water Co., which operates in Wrightstown and vicinity, has been ordered by the Board of Public Utility Commissioners to make extensive improvements in its plant, to provide increased and improved service. The proposed work includes the installation of new plant equipment.

Allentown, Pa.—Slate Belt Street Railway Co. is understood to be considering plans to increase its capital from $360,000 to $585,000, and the indebtedness of the company from $402,000 to $500,000. The company will also change its corporate name to the Slate Belt Transit Co.

Allentown, Pa.—A number of electric utility companies recently incorporated, are planning for extensive operations in this vicinity, including the production and distribution of electric energy for light and power service. These companies are Danville Borough Electric Co., East Chillisquaque Township Northumberland Electric Co., West Chillisquaque Township Northumberland Electric Co., Turbot Township Northumberland Electric Co., Milton Borough Electric Co., Rush Township Northumberland Electric Co., Mahoning Township Electric Co., Valley Township Montour Electric Co., and Liberty Township Montour Electric Co. H. R. Fehr, C. M. Walter (treasurer),

and J. S. Wise, Jr., head the companies.

Bethlehem, Pa.—City council has passed a bill authorizing a bond issue for $80,000 to cover the cost of the installation of a new ornamental electric street-lighting system. It is proposed to commence the work at the earliest possible moment, and the city is arranging for the preparation of plans and specifications at once.

Chester, Pa.—Board of managers of Chester Hospital, 16th and Parker streets, has commenced work on the construction of the proposed three-story laundry building and boiler plant at the institution at Ninth and Halley streets. The work, including equipment installation, is estimated to cost about $300,000. The Ward Building Co., Crozer building, Chester, is the contractor.

Gettysburg, Pa.—A special election has been called by the Borough Council for the purpose of voting on the issuance of bonds for $20,000, the proceeds to be used for the construction of a new municipal electric light plant and the erection of the necessary lines for street-lighting purposes.

Marcus Hook, Pa.—Union Petroleum Co. is considering the construction of a new pumping plant in connection with its local government contracts, including the installation of new boilers and other equipment.

Philadelphia, Pa.—In connection with the construction of new extensions and additions to the Philadelphia Hospital for Contagious Diseases by the Department of Health and Charities, contract has been awarded to the Electro Construction Co., Commercial Trust building, for all electrical work, at $7125.

Pittsburgh, Pa.—General Electric Co. has completed negotiations for the purchase of a portion of the property of the Eiler Lumber & Mill Co., 23rd and Wharton streets, in the south side district, for a consideration of about $75,000. The property is about 120x214 ft., and it is understood that the company is arranging plans for the construction of a large new building, to be used in part for warehouse purposes.

Stroudsburg, Pa.—International Boiler Works has acquired a 40-acre tract of land on which it proposes to build a modern plant.

Tullytown, Pa.—Tullytown Electric Co., recently organized, is considering plans for the operation of a local electric light, heat and power plant. The company has made application at the state capitol for a charter of incorporation.

York Haven, Pa.—York Haven Power Co. is making rapid progress on the construction of an addition to its electric substation on South Wood street. It is understood that the company is planning to commence the installation of machinery and equipment immediately upon completion of construction work.

Baltimore, Md.—Consolidated Gas, Electric Light & Power Co. has completed arrangements for alterations and improvements in its building at Lexington and Liberty streets, to facilitate operations.

DATES AHEAD.

American Society of Mechanical Engineers. Annual meeting, New York City, Dec. 2-5. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

Massachusetts State Association of Electrical Contractors and Dealers. Annual meeting, Worcester, Mass., Dec. 3. Headquarters, Bancroft Hotel. Secretary, J. E. Wilson, Boston.

American Institute of Chemical Engineers. Annual meeting, Savannah, Ga., Dec. 3-6. Secretary, J. C. Olsen, Brooklyn, N. Y.

Electric Power Club. Meeting, Hot Springs, Va., Dec. 11, 12 and 13. Headquarters, Homestead Hotel. Secretary, C. H. Roth, 1410 West Adams street, Chicago.

National Council of Lighting Fixture Manufacturers. Annual convention, Detroit, Mich., February, 1920. Secretary-treasurer, Charles H. Hofrichter, Cleveland, Ohio.

American Electrochemical Society. Annual convention, Boston, Mass., April 7-10, 1920. Friday, April 9, joint session with American Institute of Electrical Engineers on "Electrically Produced Alloys." Secretary, Joseph W. Richards, Bethlehem, Pa.

National Electric Light Association. Annual convention, Pasadena, Cal., May 18-21, 1920. Headquarters, Hotel Huntington. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

Winchester, Va.—Northern Virginia Power Co. is understood to be considering plans for the extension of its electric lighting system to Strasburg, Shenandoah county. The company was recently acquired by the Potomac Light & Power Co., Baltimore, Md.

Wilmington, N. C.—Notice has been filed with the Secretary of State by the Tidewater Power Co. of an increase in its capitalization of $2,600,000, to provide for general business expansion.

Greenville, S. C.—Thomas N. Walker Co. will establish electric lighting and power plant in connection with the development of Oakville, a residential suburb five miles from Greenville.

Greer, S. C.—The power house at plant of the Greer Water & Light Co. was destroyed by fire. C. C. McGowan, manager.

Chipley, Ga.—Plans are under consideration by the city officials for the construction of a new municipal electric light plant. S. A. Goodman is mayor.

Columbus, Ga.—In connection with the proposed additions to the plant of the Columbus Manufacturing Co., contracts for which have been awarded, estimated to cost, including equipment, $1,000,000, it is planned to install a total of about 1000 looms, to be operated by individual motor drive. Contract for electric motors for this purpose has been awarded to the General Electric Co.

Dawson, Ga.—A white way lighting system is proposed. The electric wires may be laid underground. Address mayor.

Talbotton, Ga.—City is having plans prepared for the construction of a new municipal power plant, including the establishment of an electric light system.

Tifton, Ga.—Southern Bell Telephone & Telegraph Co. will erect a new telephone exchange at a cost of $450,000. Chief engineer, Atlanta, Ga.

Jacksonville, Fla.—Additional improvements of municipal electric light plant are contemplated. John S. Bond, chairman of city commission.

Jacksonville, Fla.—Acceptance by the Navy Department of the offer of the city commission of Jacksonville of a tract of land and other facilities at the municipal docks and terminals for the erection of a high-powered radio station was announced in a letter to the commission from Secretary Daniels. Plans and specifications for the station will be prepared immediately.

NORTH CENTRAL STATES.

Akron, Ohio.—Ground has been broken for the erection of Plant No. 2 by the Firestone Tire & Rubber Co. The building will be three stories high and is designed to accommodate the electrical, machine, pipe, carpenter, pattern and tin shops. It will coordinate under one roof all the labor of this nature done in the various buildings of the tire factory. The structure will be modern in every respect and all mechanical equipment will be strictly up-to-date. Electric traveling cranes will be employed to carry heavy machinery. The cost of construction is said to exceed $400,000.

Dover, Ohio.—About $100,000 will be expended to improve the city power plant. W. H. Scheu, mayor.

Lima, Ohio.—Lake Erie & Western Co. will erect a power plant. Address Superintendent Peters.

Toledo, Ohio.—Toledo Railways & Light Co. has proposed to the city a $2,000,000 10-year street-lighting contract.

Auburn, Ind.—Auburn Water & Electric Light Co. will install a 480 hp. boiler, build a brick stack 135 ft. high, 6½ ft. in diameter at the top; equip the plant with an automatic coal conveyor; install an automatic underfeed stoker under three boilers and make other improvements. To this end the company has asked approval of the Indiana Public Service Commission for the issuance of $40,000 in bonds.

Decatur, Ind.—General Electric Co. has announced that it will erect a new branch factory in Decatur. The new plant will be a one-story building, 200x300 ft., brick and steel. It is planned to have the factory start operations March 1, 1920, and employment will be given to 500 persons. The new plant will have trackage connections with the Grand Rapids & Indiana railway.

Marquette, Mich.—Houghton County Electric Light Co. is making improvements in its lines from Laurium and Dollar Bay, at an estimated cost of $12,000. The installation of a substation at Lake Linden is also contemplated.

Chicago, Ill.—A. M. Castle & Co., 715 North Morgan street, have purchased property, 219x561 ft., at the northwest corner of Blackhawk street and Cherry avenue, on which they will

erect a building with floor space of approximately 200,000 sq. ft.

Chicago, Ill.—Fairbanks, Morse & Co., manufacturers of electrical and railroad equipment, gasoline and oil engines, etc., will erect a big warehouse at 38th street and Loomis place, in the central manufacturing district. The lot has a frontage of 300 ft. and a depth of 150 ft. The building will be a three-story structure of brick and reinforced concrete construction, 150x 210 ft., and will cost about $315,000.

Chicago, Ill.—H. M. Byllesby & Co., public utility operators, plan immediate construction of three new power stations, one in southern Minnesota for the Northern States Power Co., one in western Oklahoma for the Oklahoma Gas & Electric Co., and one at Pueblo on the present power site of the Arkansas Valley Railway, Light & Power Co., with combined initial capacity of 33,500 hp. at an estimated cost of about $3,000,000. These and other projected improvements, including a new 40,000-hp. unit under construction at Minneapolis, will add 100,000 hp. to Byllesby properties during 1920.

East St. Louis, Ill.—The machine shops of the St. Louis, Troy & Eastern Railroad Co. have been destroyed by fire.

Evansville, Ind.—Schroeder Headlight & Generator Co. will erect a new addition to its plant.

Fort Wayne, Ind.—Fort Wayne Battery Manufacturing Co. will on Jan. 1, 1920, begin the manufacture of storage batteries for automobiles and lighting systems. The company is completing a two-story building, 54x 196 ft., and a boiler house, 50x57 ft. The company has taken options on several vacant lots surrounding the plant for future expansion. Among the directors are S. A. Lehman, J. C. Sherer and George Houser.

Indianapolis, Ind.—H. C. S. Motor Car Co. will erect two four-story factory buildings, brick and concrete, each building 80 by 205 ft.

Marion, Ind.—Board of education plans erection of $80,000 school building to replace one destroyed by fire Nov. 19.

Marion, Ind.—Marion Insulated Wire & Rubber Co. has increased its capital stock from $100,000 to $500,000.

Portland, Ind.—Jesse E. Poting has the contract to erect an electric light plant at a cost of $16,441.

East St. Louis, Ill.—Erco Amusement Co. will erect a fireproof theater, 120x120 ft., to cost $200,000.

Marseilles, Ill.—National Biscuit Co. will erect combination warehouse and manufacturing plant as addition to present mill buildings. The new structure will be an addition to the main plant and will occupy the site of the old paper mill which was destroyed by fire a few years ago.

Peoria, Ill.—Western Structural & Machine Works has taken over the plant and business of the J. C. Armstrong Machine Co. The company handles machine, pattern, tool and die work, power plant work, engine boring and rebuilding, and general machine work of all kinds.

Taylorville, Ill.—Taylorville Utility Co., dealer in light, heat and power, has increased its capital to $100,000. H. M. Hallock, president; Walter M. Provins, secretary.

Sorento, Ill.—The sum of $5000 in electric light bonds has been authorized. Address village clerk.

Urbana, Ill.—University of Illinois will install two new boilers, each of 500 hp., Jan. 1. This will increase the present capacity of 3000 hp. 50%.

Colfax, Wis.—Colfax Light & Power Co., Amery, Wis., will erect a power house and dam here. Work will start in the spring. Engineer J. C. Jacobson, 53 Metropolitan Bank building, Minneapolis, Minn.

Marinette, Wis.—Wisconsin Service Co. contemplates a reserve dam at High Falls on the Peshtigo river.

Rutland, Wis. (P. O. Stoughton)—East Rutland Electric Co. will construct a power plant to furnish power to the towns of Dunkirk and Rutland. Ole H. Eddingsaas, W. J. Richardson and Bennie Oxrude are interested.

Stanley, Wis.—A new line is to be constructed between Chippewa Falls and Stanley to carry the current from Wissota dam to the consumers along the Soo. The work will be completed by next May.

Sturgeon Bay, Wis.—High Falls Power Co. contemplates the erection of transmission lines from High Falls to Sturgeon Bay. J. C. Langemack, city clerk.

Tomah, Wis.—The local plant of the Wisconsin-Minnesota Light & Power Co. has been purchased by Messrs. Louis Barnes and Philip Bennett, who will continue its operation under the name of the Tomah Electric & Power Co.

Union Grove, Wis.—The trustees of Union Grove have granted permission to the Milwaukee Electric Railway & Light Co. to establish a new electric lighting system in that village.

Waupaca, Wis.—Waupaca Electric Service & Railway Co. will erect a new electric plant. Truman Hibbard, president.

Albert Lea, Minn.—Minnesota Gas & Electric Co. has purchased capital stock owned by G. C. Edwards, president of the H. L. Nichols Co., and contemplates furnishing electric energy to communities outside of Freeborn county. Improvements will be made at an estimated cost of $50,000.

Clearbrook, Minn. — Clearbrook Electric Co. will construct electric light plant and install white way. E. T. Evenson, village recorder.

Crosby, Minn.—The city contemplates the purchase of poles, wires, and other holdings of Cuyuna Range Power Co. H. L. Nicholson, village recorder.

Glyndon, Minn.—The village will install electric light plant and extend lines from Dilworth. R. S. Brown, village recorder.

Perley, Minn.—The city will erect an electric light plant. Engineer W. E. Skinner, 15 South 5th street, Minneapolis. B. I. Hoglun, clerk.

Clinton, Iowa.—Low Moore Light & Power Co. and Clinton, Davenport & Muscatine Interurban Co. have been granted franchise for constructing power, heat and light line from Shafton to Low Moore.

Dubuque, Iowa.—The building of the International Harvester Co. has been destroyed by fire with $260,000 loss.

Sioux City, Iowa.—Harger & Blish will erect factory building, 50x100 ft., to cost $80,000.

Kansas City, Mo. — Sherwin-Williams Co., Cleveland, Ohio, will build a $500,000 factory, comprising an initial unit equipped for the manufacture of paint.

Marceline, Mo.—The city contemplates bond issue for an electric light plant. Address mayor.

Memphis, Mo.—The city will vote Dec. 5 on $10,000 bonds for extending the electric light plant. Address the mayor.

St. Louis, Mo.—Emerson Electric Manufacturing Co. contemplates the erection of a large new factory building, immediately adjoining the present extensive plant, to provide adequate facilities for meeting the increased demand for its products. The plant with machinery and other equipment installed will cost approximately $750,000.

Spivey, Kans.—The sum of $10,000 in bonds have been voted to install an electric light plant. W. B. Rollins & Co., 209 Railway Exchange building, Kansas City, Mo., engineers.

Wichita, Kans. — Extensive improvements in the electric light and power system will be made. Bids are being received on new machinery and engines which are to be installed in the power and water plants.

Chancellor, S. D.—Plans are being made whereby power lines will be extended from the electric light and power plant at Hartford to Chancellor.

Yankton, S. D.—Yankton is enjoying such a substantial growth that the enlargement of the local light and power system has become necessary. Extensive improvements are planned. The company recently was reorganized, with ample capital to make the contemplated improvements. It is further planned to have the power plant of such capacity that power wires can be extended from Yankton to adjoining towns, so they can be provided with electricity for lighting and power purposes from the central plant here.

Ellendale, N. D.—Ellendale Electric Co. will enlarge its plant and install another engine. It also contemplates the erection of transmission lines to Menango and Fullerton.

Grand Forks, N. D.—The new state-owned elevator and flour mill to be located in Grand Forks will have a capacity of 3000 bbls. of flour per day. Standard Oil Co. has taken out permits for $250,000 worth of construction in Grand Forks covering a distributing station and office.

SOUTH CENTRAL STATES.

Hazard, Ky.—Hazard Coal Co. is planning for the immediate installation of new power plant equipment at its works, to cost about $10,000.

Hazard, Ky.—Kentucky & West Virginia Power Co., with headquarters at 30 Church street, New York, which recently filed articles of incorporation with a capital of $6,000,000, is understood to be arranging plans for the construction of a new addition to its local power plant for increased operations. F. R. Weller, Hibbs building, Washington, D. C., is consulting engineer; R. E. Breeb is president.

Mayking, Ky.—Pine Creek Coal Co. is arranging plans for the construction of a new power plant at its local coal mining properties, to provide for increased capacity.

Parsons, Ky.—Plans are being prepared by the Elkhorn By-Product Coal Co. for the installation of a quantity of new power equipment at its plant in the Fleming district.

Chattanooga, Tenn.—International Harvester Co., Chicago, plans to double the capacity of the plant of the Chattanooga Plow Co. by the erection of an addition to its main plant. Plans are also being made for a $10,000 building containing club rooms, cafeteria, locker rooms and gymnasium.

Sequatchee, Tenn.—Crossville will have electric lights, a company composed of M. F. Reed, J. S. Reed and B. A. Smith having been formed to install a plant. A franchise to use the streets for the erection of poles will be granted by the city.

Gadsden, Ala.—An election will be held Jan. 6 to vote on a $100,000 municipal light plant and $90,000 sanitary sewer bonds. Address mayor.

Rolling Rock, Miss.—City has approved a bond issue of $60,000 the proceeds to be used to cover the cost of the construction of a new municipal electric light and waterworks plant. Xavier A. Kramer, Magnolia, Miss., is consulting engineer.

Little Rock, Ark.—Little Rock Railway & Electric Co. will sell $376,500 bonds to finance extensive improvements in its plant, extend its electric transmission on lines and improve its service generally. Many improvements in the plant are contemplated, including a giant smokestack, new boilers and other machinery and will install fuel saving devices to cost $60,000, which will effect a large saving in fuel for the power plant. The company expects to extend its lines to North Little Rock which, in case of emergency, may be tied in with the lines of the Arkansas Light & Power Co.

Drumright, Okla.—The Drumright division of the Oklahoma Gas & Electric Co. has completed extension of its transmission lines to the No-co-Che lease of the Shaffer Oil & Refining Co. where a number of wells will be pumped electrically.

Miami, Okla.—A loss of $75,000 was sustained when fire visited the power plant of the Miami Traction Co.

Thomas, Okla.—Plans are being prepared by the city for improvements and alterations in the municipal electric light plant, including the installation of a new Diesel engine, for increased service.

Electra, Tex.—The city council has under consideration the construction of a municipal electric light and power plant for that city.

Lubbock, Tex.—City is having plans made for extensions in the municipal electric light system. It is proposed to issue bonds for $15,000 to cover the cost of work.

Snyder, Tex.—G. I. Wilcox of Snyder has sold the local electric light plant to Messrs. Yoder and McCormick of Crowell. The new owners will install new machinery and make other improvements to the plant.

WESTERN STATES.

Pueblo, Colo.—A new tract of 1000 acres of land north of Fowler, Colo., will be irrigated by electric power next year, if plans under way mature. This will give the Arkansas Valley Railway, Light & Power Co. an additional 150 hp. of irrigation business. The company's output is running 15% ahead of last year.

Boise, Ida.—Utah Power & Light Co. has filed application with the Public Utilities Commission for permission to extend its lines to Clifton, Oxford and Dayton, and neighboring districts, for the furnishing of electric energy for light and power service.

Everett, Wash.—Plans are under consideration for improvements in the electric street-lighting system, including the installation of a new cluster type lighting system in the downtown district.

Holson, Wash.—The city will estimate its own public utilities, particularly light and water.

Vancouver, Wash.—City council is understood to be considering plans for the installation of a new modern electric street-lighting system throughout the municipality.

Portland, Ore.—A new lighting system will be installed by Northwestern Electric Co. Estimated cost, $20,000 to $25,000.

Young's Bay, Ore.—Pacific Power & Light Co. has recently completed arrangements for the construction of a large new power and gas plant on local property acquired comprising approximately 15 acres. It is said that the proposed works will cost in excess of $750,000, including equipment installation.

Los Angeles, Cal.—Board of Public Works has taken bids for the immediate installation of the proposed new ornamental electric street-lighting system on Westmoreland avenue, to extend from Wilshire to Seventh street. Marbelite lighting standards will be utilized in connection with the work.

Orange, Cal.—City trustees have recently taken bids for the installation of a new ornamental electric street-lighting system on Chapman and Glassel streets, located in the business section of the city. The work is estimated to cost $15,000.

Richmond, Cal.—City council is having plans prepared for the immediate installation of a new ornamental electric street-lighting system throughout the business district of the municipality. Service will be furnished by the Western States Gas & Electric Co.

Richmond, Cal.—Pacific Sanitary Manufacturing Co. will shortly install an additional 50 hp. in motors, and the Metals Atomizing Co. (a new concern) will start operations with one 100-hp. unit. Both will be served by the Richmond division of the Western States Gas & Electric Co. The second named company will add other units later. A new oil tank company building at Point Orient will require 25 hp. in motors.

Rio Vista, Cal.—Great Western Power Co. is having plans prepared for the immediate construction of a new power line extending from the company's pumping works in Reclamation District 999 to the Elkhorn Slough section of the property of the Holland Land Co., a distance of about five miles.

San Francisco, Cal.—Great Western Power Co. has completed plans for the construction of a new power line to extend to Franklin, near Sacramento, for the furnishing of electric service, the proposed line to cover a distance of about 12 miles; it is estimated to cost approximately $20,000. In connection with this work, plans are being arranged for the construction of a new substation at Hood, Cal., at which point a power line of 22,000-volt capacity will also be constructed.

Vallejo, Cal.—Plans are being arranged by the United States government for the construction of a new radio station, to be located in the Mare Island district. The work includes the construction of three large radio towers, and is estimated to cost $150,000.

FOREIGN TRADE

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Telephone and Telegraph Apparatus (31,297).—A firm in Spain desires to secure the representation of a manufacturer of telephone and telegraph apparatus and supplies. It guarantees deposit on consignment of models manufactured in the United States. Quotations should be given c. i. f. Spanish ports, if possible, or f. o. b. New York. Correspondence should be in Spanish. References.

Electrically Operated Pianos (31,299).—Catalogs, quoting prices and terms of payment, of all kinds of musical instruments, and especially electric coin-operated pianos, are described by a firm in Norway. Reference.

Personals

M. S. Sloan Chairman Committee on Electrical Resources N.E.L.A.—F. R. Slater Resigns—S. A. Rhodes Promoted

J. F. CANFIELD, formerly auditor of the Ottumwa Railway & Light Co., Ottumwa, has been appointed auditor of the Union Light, Heat & Power Co., Fargo, N. D.

DON H. BLANKS has been appointed manager of railways for the Monongahela Valley Traction Co., at Fairmont, W. Va. He succeeds W. C. Callaghan, who resigned.

RALPH J. FOGG, who has been a member of the civil engineering department at Lehigh University during the last 11 years, has been appointed professor of civil engineering and head of the department. He takes the place vacated by Professor McKibben, who went to Union College at Schenectady.

R. F. PALMBLADE, general superintendent of the Jefferson City Bridge Transit Co., Jefferson City, Mo., will succeed Rufus W. Bailey as general superintendent of the Peoria Railway Co., Peoria, Ill. Mr. Palmblade is well acquainted with rolling stock, general equipment and conditions of operation of the Peoria Railway Co., as he was formerly operating engineer of that company.

W. L. R. EMMET, consulting engineer with the General Electric Co., Schenectady, N. Y., and one of the world's foremost experts on steam turbine design, delivered a paper on "Electric Propulsion of Ships" before the Society of Naval Architects and Marine Engineers at its twenty-seventh general meeting held in New York recently. He has made an extensive study of electric propulsion of ships and in co-operation with the Bureau of Steam Engineering, U. S. Navy, applied electric drive to the battleship *New Mexico*.

FRED R. SLATER has resigned as vice-president and general manager of the Texas Power & Light Co., Dallas, Tex., to take up another line of business and will remain in Dallas. Before joining the company about five years ago as general superintendent, Mr. Slater was engaged as an electrical and construction engineer in New York City. He was connected with William G. McAdoo in the building of the Hudson tubes under the East river. Mr. Slater is well known in the public utility field in the Southwest, and has been prominently identified with various organizations, having served as president of both the Southwestern Electrical and Gas Association and the Dallas Jovian League.

M. S. SLOAN, president of the Brooklyn Edison Co., Brooklyn, N. Y., has been appointed chairman of the recently organized Committee on Electrical Resources of the Nation, National Electric Light Association. Mr. Sloan is a graduate of the Alabama Polytechnic Institute and entered the utility business in 1906 with the Birmingham Railway, Light & Power Co., Birmingham, Ala. During the six years with which he was associated with the Birmingham utility, he rose from the position of chief engineer to assistant to the president, with supervision over all departments. In 1913 he left Birmingham for New Orleans, La., where he held the position of vice-president and general manager of the New Orleans Railway & Light Co. In the latter part of 1917 he became operating manager of the New York Edison Co. and on Aug. 1 of this year was elected to the presidency of the Brooklyn Edison Co., Inc.

M. S. Sloan.

Mr. Sloan is a firm believer in giving prompt and satisfactory service to the community and in effecting harmony and efficiency in all departments of his organization, so treating his employes as to make them happy and contented. It is his belief that in carrying out such a policy, he is performing the best and highest service to the stockholders of the company. His previous career has demonstrated that he has the strength and skill to accomplish such a program. Mr. Sloan is vice-president of the Association of Edison Illuminating Companies, treasurer of the Electrical Testing Laboratories and is identified with other organizations.

B. J. GRIGSBY, vice-president of the Anderson Electric Specialty Co., Chicago, is visiting London and Paris in connection with the distribution of the company's products in Great Britain and France. Mr. Grigsby is particularly acquainted with those markets, having been managing director of the Benjamin Electric, Ltd., in London, for nearly ten years, manufacturing electrical and automobile accessories.

CHARLES F. SCRIBNER, formerly industrial engineer with the Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn., and more recently consulting engineer for L. V. Estes, Inc., Chicago, has become associated with the Business Service Corp. of America, Chicago, in the capacity of vice-president and chief engineer.

S. A. RHODES, acting chief engineer of the central group of Bell Telephone Companies, has been promoted to the position of chief engineer. Mr. Rhodes, who is an associate member of the American Institute of Electrical Engineers, was graduated from the Lehigh University in 1892. Shortly thereafter he established himself in Chicago, and his first association with active telephone work was on some inspections in connection with cable and conduit construction for the Chicago Telephone Co. He has ever since continued in the engineering department of the Chicago Telephone Co. and the engineering department of the central group of Bell Telephone Companies. About 1895, when the use of common-battery equipment was inaugurated, the Chicago company carried on considerable development work in connection with subscribers' station equipment and central office equipment for common-battery operation, and in this work Mr. Rhodes took a very active part. After the common-battery equipment became standardized, he became chiefly engaged in engineering in connection with outside plant and substation equipment. When the central group was formed in 1911 he continued work of a similar nature for the group under the title of material engineer. About this time the matter of providing adequate transmission over trunks and toll lines assumed much importance, and Mr. Rhodes was assigned transmission problems handled by the central engineering department, later being given the title of transmission engineer. In this capacity he continued until he became acting chief engineer of the central group in February of this year.

Obituary.

PERCY H. ASHMEAD, 52 years old, a consulting engineer, who was head of the Costa Rica-Nicaragua boundary dispute arbitration commission, died of pneumonia on Nov. 11 in New York. He was born in Philadelphia and was graduated from Lehigh University. He planned a railroad for the Chinese Government many years ago and also worked on the Madeira-Mamore railroad in Brazil. At one time Mr. Ashmead was in charge of the construction of railroads in the Philippine Islands, and for many years he was chief engineer of J. G. White & Co., of New York City. He was a major in charge of the supplies for the Engineer Corps at Washington during the war.

For the Readjustment Period—What?

LVIX.

Trade Advisors of Other Nations Coming to San Francisco

America's first world conference of American Foreign Traders, with special trade advisors from the Far East, Australasia, and South America, appointed by the various foreign governments, will be one of the important features of the Seventh National Trade Convention to be held at San Francisco, May 12-15, 1920, according to the preliminary plans of the Convention just announced at the Annual Meeting of the National Foreign Trade Council.

The bringing of special trade representatives from the foreign nations to San Francisco so that they may be consulted by American business men is something that should appeal to every manufacturer, merchant and trade organization in the country, says Secretary O. K. Davis, in commenting on this feature of the program. For the purpose of meeting these foreign trade advisors as well as the large number of Americans who are now doing business in foreign countries, who have been invited to attend, the Council is taking steps to have the San Francisco Convention one of the largest ever held in this country.

Chairman Frederick J. Koster, of the Pacific Coast Committee, announces that elaborate preparations for the Convention are being made on the Pacific Coast. The Seattle, Portland, San Francisco and Los Angeles Chambers of Commerce are co-operating in plans to make the journey to the Pacific Coast atttractive for those who attend the convention. Seattle is arranging an exhibition of products of the Far East, San Francisco an exhibition of Pacific Coast products, and Los Angeles an exhibition of the products of South America and Australasia.

Arrangements have been completed for two special steamers from the Far East and one from Valparaiso up the west coast of South America to bring the delegates to the Convention. A special steamer will be provided to take delegates from the East through the Panama Canal to San Francisco. This ship will sail from New York about April 20.

The Convention program will consider chiefly the effect upon American foreign trade of the fact that the United States has become a creditor nation during the war. The discussion at the Annual Meeting of the Foreign Trade Council showed that the members of the Council are giving careful study to the increase of imports that is bound to come to this country in satisfaction of the annual interest upon the huge loans that have been extended to Europe. This question will be threshed out from every angle at the San Francisco convention.

Extensive plans are under way for the entertainment of delegates to the convention and their families and in every way preparations are being made to care for the large attendance which is anticipated.

Special transcontinental trains are announced for the convenience of delegates in the United States. These trains will be made up of special cars from various cities, for reservations in which applications should be made to O. K. Davis, Secretary, National Foreign Trade Council, 1 Hanover Square, New York City.

C. A. TUPPER, President : International Trade Press, Inc., Chicago

Financial News

Warfare on Public Investors.

In a recent isue of Wall Street Journal there appears an article by William L. Ransom, former counsel for the Public Service Commission of the First District, New York, in which he discusses the essentials of a sound regulatory policy in respect to the investor. This is briefly quoted as follows:

"We have had in the United States nearly ten years of deliberate, well-planned warfare to intimidate investors from furnishing the needed new capital for railway and other public service projects. In some instances, this crusade has been the by-product of a narrow but zealous view of public rights as to franchise-holding companies, but it much more generally has been the work of men who believed that manifestations of extreme hostility to the owners of these enterprises would be so popular as to lead naturally to political preferment, and, in many instances, the campaign of terrorism and affrightment of investors has been inspired by those who realized that if private funds would not furnish the requisite capital for new construction and new financing, the treasury of government would of necessity be resorted to, and that the most effective step towards the governmental acquisition of all basic utilities would be to force existing properties into the bankruptcy court or upon the bargain counter.

"In the discussions which have taken place in the National Congress, and in much of the more recent discussion as to the plight of utilities in our states and cities, there has been discernible what may be termed a new realization of the relationship of the investor to the whole problem of the public service. If we are to avoid and withstand the wholesale socialization of the railway, light, heat, power and traction enterprises of the country, conditions must be restored which will attract private capital freely, normally and adequately, under proper safeguards and guarantees, again into this important field. Investors and the general public may well grasp the situation and join hands in dealing with it. The insidious campaign which has made private capital unwilling to risk further outlays in the railway and public utility field has had for its conscious objective the compelling of resort to governmental funds instead, and the clubbing of the present owners into willingness to sell outright on a bargain basis."

Thomas W. Hulme, vice-chairman of Railway President Committee on Valuation, speaking on relation of valuation to investment, said the courts have held true valuation is not original cost, but present value. The determining factors of present value are investments, cost of reproduction, condition of property and earning power. Even in rate decisions not merely physical value, but "going concern value," or good will have received consideration. These principles will be brought to the attention of the Interstate Commerce Commission in a conference to be held in January.

Cities Service Earnings Show Substantial Increase.

Earnings of Cities Service Co. for October, 1919, show a fair increase over the preceding month, indicating that the improvement in earnings noted in the September statement is still continuing. Gross earnings of Cities Service Co. for October, 1919, were larger by $37,756 than for September, while the amount available for payment of dividends on the preferred stock for the month increased $40,451. The balance available for reserves, dividends on the common stock and surplus for October showed a gain of $38,987 over the preceding month, and an increase of $195,820 over the balance for August, 1919.

In conformity with the policy announced in May, 1916, the directors at their November meeting increased the rate of stock dividends being paid on the common stock from 12% annually to 15% annually by declaring a monthly dividend of 1¼% on the common stock, payable in common stock at par on Feb. 1, 1920, to stock of record Jan. 15, 1920. The board also declared the regular monthly dividends, payable in cash, of one-half of 1% on the preferred stock and one-half of 1% on common stock, both payable Feb. 1, 1920, to stock of record Jan. 15, 1920.

In 1916 and 1917 Cities Service Co. paid 6% in stock dividends on the common stock, in 1918 9% was paid on the common stock in stock dividends, and the present rate of payment of these dividends is 12%. The directors at the meeting also approved the issue and sale of the $3,000,000 par value preference B shares recently offered to stockholders of Cities Service Co., which offering was heavily oversubscribed, and declared the initial monthly dividend on the 6% cumulative preference B shares of one-half of 1% payable Jan. 1, 1920, to shares of record Dec. 15, 1919.

Indiana Power Acquires Power & Water Company.

The Indiana Public Service Commission has granted permission to the Indiana Power Co. to issue bonds and stock to take over the property of the Indiana Power & Water Co. The commission authorized the company to sell at not less than 90% of par $750,000 of its first and refunding mortgage 25-year 6% bonds and $500,000 of its 7% cumulative preferred stock and to issue at not less than par $300,000 of its common stock, the proceeds to be used to cover the costs of extensions and betterments and property acquisitions; also to issue to its stockholders at par $150,000 of common stock to reimburse them for the loss of dividends incurred through increasing their equities in the property.

Dividends.

A quarterly dividend of $1.50 per share on preferred stock has been declared by the Connecticut Power Co., payable Dec. 1 to stock of record Nov. 20.

The American Power & Light Co. has declared a quarterly dividend of 1%, payable Dec. 1 to stock of record Nov. 21.

The Fairbanks-Morse Co. has declared a quarterly dividend of 1½% on preferred stock, payable Dec. 1 to stock of record Nov. 20.

Key West Electric Co. has declared a quarterly dividend of $1.50 on preferred stock, payable Dec. 1 to stock of record Nov. 18.

Northern Texas Electric Co. has declared a dividend of $2 per share, payable Dec. 1 to stockholders of record Nov. 21.

Wisconsin-Minnesota Light & Power Co. has declared a quarterly dividend of 1¾%, payable Dec. 1 to stock of record Nov. 20.

Eastern Wisconsin Electric Co. has declared a quarterly dividend of 1¾%, payable Dec. 1 to stock of record Nov. 20.

Marconi Co. of America has declared a dividend of 5%, payable Jan. 2 to stock of record Dec. 10.

Baton Rouge Electric Co. has declared a semi-annual dividend of $4 per share, also a semi-annual dividend of $3 per share on preferred stock, both payable Dec. 1 to stock of record Nov. 25.

Canadian General Electric Co. has declared a quarterly dividend of 2%, payable Jan. 2 to stock of record Dec. 11.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Nov. 18.	Bid Nov. 25.
Adirondack Electric Power of Glens Falls, common	6	14	12
Adirondack Electric Power of Glens Falls, preferred	6	76	76
American Gas & Electric of New York, common	10+extra	125	120
American Gas & Electric of New York, preferred	6	39	39½
American Light & Traction of New York, common	..	208	210
American Light & Traction of New York, preferred	6	93	93
American Power & Light of New York, common	4	59	57
American Power & Light of New York, preferred	6	71	70
American Public Utilities of Grand Rapids, common	..	8	8
American Public Utilities of Grand Rapids, preferred	7	23	24
American Telephone & Telegraph of New York	..	100	100
American Water Works & Elec. of New York, common	..	5	5
American Water Works & Elec. of New York, particip	7	9	9
American Water Works & Elec. of New York, first preferred	..	50	50
Appalachian Power, common	..	4	4
Appalachian Power, preferred	7	22	21
Cities Service of New York, common	+extra	437	437
Cities Service of New York, preferred	6	76	75
Commonwealth Edison of Chicago	8	110¾	110¼
Comm. Power, Railway & Light of Jackson, common	..	23	21
Comm. Power, Railway & Light of Jackson, preferred	6	46	46
Federal Light & Traction of New York, common	..	7	8
Federal Light & Traction of New York, preferred	..	43	43
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	25	25
Middle West Utilities of Chicago, preferred	6	50	49½
Northern States Power of Chicago, common	..	64	65
Northern States Power of Chicago, preferred	ex.div.7	90	90
Pacific Gas & Electric of San Francisco, common	..	61	62
Pacific Gas & Electric of San Francisco, preferred	6	..	..
Public Service of Northern Illinois, Chicago, common	7	80	83
Public Service of Northern Illinois, Chicago, preferred	6	85	86
Republic Railway & Light of Youngstown, common	4	14	14
Republic Railway & Light of Youngstown, preferred	6	50	50
Standard Gas & Electric of Chicago, common	..	30	28
Standard Gas & Electric of Chicago, preferred	6	42	42
Tennessee Railway, Light & Power of Chattanooga, common	..	3	3
Tennessee Railway, Light & Power of Chattanooga, preferred	6	7	5
United Light & Railways of Grand Rapids, common	4	43	43
United Light & Railways of Grand Rapids, preferred	6	70	70
Western Power of San Francisco, common	..	21½	20
Western Union Telegraph of New York	extra	87¼	88
Industries.			
Electric Storage of Philadelphia, common	4	135	141
General Electric of Schenectady	8	171½	169½
Westinghouse Electric & Mfg. of Pittsburgh, common	7	54¾	53¾
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	..	..